

***Cobia Management: How the Atlantic States Marine Fisheries Commission could take part in
the management of the cobia fishery
South Atlantic State/Federal Fisheries Management Board
August 2016***

Introduction

Cobia (*Rachycentron canadum*) is a member of the family Rachycentridae and is distributed worldwide in tropical, subtropical and warm-temperate waters. In the western Atlantic they occur from Nova Scotia, Canada, south to Argentina, including the Caribbean Sea. It is abundant in warm waters off the coast of the U.S. from the Chesapeake Bay south and throughout the Gulf. Cobia prefer water temperatures between 68-86°F. As a result of their wide distribution and genetic stock differences, cobia are managed as two distinct groups. The Gulf Migratory Group cobia (GMG) includes those fish off the East coast of Florida and into the Gulf of Mexico. GMG cobia are currently managed by the Gulf of Mexico Fishery Management Council, with the exception of the East coast of Florida which is managed by the South Atlantic Fishery Management Council (SAFMC). Atlantic Migratory Group cobia (AMG cobia) occur from Georgia to New York. AMG cobia are currently managed by the SAFMC through the Coastal Migratory Pelagics Fishery Management Plan; the Mid-Atlantic Fishery Management Council (MAFMC) participates through two voting seats on the SAFMC's Mackerel/Cobia Committee.

Recreational cobia landings in 2015 were 1,540,776 pounds, 145% over the annual catch limit (ACL), resulting in a June 20, 2016 closure of the fishery by NOAA Fisheries. Commercial cobia landings in 2015 were 83,148 pounds, 38% over the ACL. Late landings reports in 2015 precluded a timely closure of the commercial fishery.

Concerns were expressed by individual states whose recreational seasons were significantly reduced by the closure due to the overage of the 2015 quota. North Carolina and Virginia developed alternate management strategies to avoid the June 20, 2016 closure enacted by NOAA Fisheries for 2016. South Carolina has recently implemented more restrictive measures that are consistent with the actions of NOAA Fisheries in some areas.

As a result of the significant overage of the 2015 recreational ACL, the jurisdictional impacts and the observation that on average 82% of reported recreational landings are harvested in state waters, the SAFMC requested that the Atlantic States Marine Fisheries Commission (ASMFC) consider complementary or joint management of the cobia resource. The ASMFC considered this request at the May 2016 meeting and agreed that ASMFC management of cobia may be prudent. The ISFMP Policy Board directed the South Atlantic State/Federal Fisheries Management Board (Board) to develop options for how the ASMFC could be involved with cobia management to consider at the August 2016 meeting.

Life History

Cobia is a fast growing, moderately lived species that supports a valuable recreational fishery throughout the south Atlantic and into the mid-Atlantic region. Known for their readiness to

take a bait, tough fighting abilities, and excellent table fare, the fishery is popular. The commercial fishery is primarily a by-catch in other directed fisheries such as the hook and line fishery for snapper/grouper and troll fisheries for various species (e.g., king mackerel, dolphin).

Cobia grow rapidly in their first 2 years with most mature at age 2. Females grow faster and attain larger sizes than males. Spawning occurs during a protracted spawning season from April through September. Consistent with protracted spawning, cobia spawn multiple batches of eggs throughout the season.

Recent genetic and stock structure analysis suggests the Florida portion of the stock is more appropriately managed with the Gulf of Mexico stock, while the Georgia to New York population comprise a separate, northern component. While cobia do frequent areas north of Virginia, the harvest is uncommon and sporadic. Landings have been episodically reported from Maryland, New York, New Jersey and Rhode Island and make up from 3-15% of the total mid-Atlantic landings.

The 2013 stock assessment conducted through the SouthEast Data Assessment and Review (SEDAR) process indicated overfishing is not occurring and the stock is not overfished. The current ACL is a precautionary approach to prevent the stock reaching an overfished status. The recent overage in 2015, exceeded the Council defined Overfishing Limit.

The 2013 stock assessment does provide some reasons for concern. While the terminal year of the assessment was 2011, Spawning Stock Biomass (SSB) experienced a general decline from 2002 forward (Figure 1). Further, recreational landings have increased over the latter portion of the time series that may increase potential overfishing issues in the next assessment. In June, the SAFMC proposed cobia be included in a 2017 Stock ID workshop and the 2018 SEDAR schedule for a benchmark assessment.

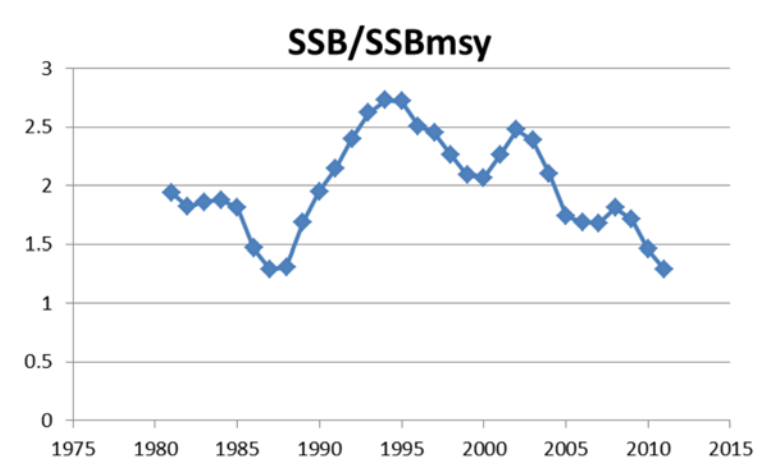


Figure 1. Spawning stock biomass relative to the MSY biomass reference for 1981-2011. SSB estimates are available farther back in time; this period was chosen to highlight the impact of landings during this time on SSB estimates

Cobia Fishery

There is both a commercial and recreational cobia fishery along the Atlantic coast. Management measures include size limits, possession limits, trip limits and quotas. State specific recreational measures vary coastwide and can be found in Table 3. Commercial restrictions, aside from the ACL, are consistent throughout most of the range with a 33"FL size limit and 2 fish trip limit. The distribution of the quota between commercial and recreational sectors is based on historical landings (50% is based on the average 2000-2008 landings and 50% is based on the average 2006-2008). Beginning in 2016, and expected to hold constant until a future assessment, the quota is split 92% recreational and 8% commercial. The 2016 Allowable Biological Catch (ABC) for AMG cobia is 670,000 pounds. The recreational ACL is 620,000 pounds and the commercial ACL is 50,000 pounds. The ABC for 2015 was slightly higher at 690,000 pounds.

Recreational cobia fisheries are prosecuted similarly along the coast. The primary methods include bottom fishing with live or dead natural bait and sight casting to single or small pods of fish, oftentimes around schools of bait (e.g., menhaden, thread fin shad). The popularity of sight casting has grown recently, resulting in increased interest in the fishery. Further, this interest has resulted in a lucrative expansion in the tackle market as baits are relatively specific for these large fish. Recreational landings for AMG cobia have varied with little trend since 2005, however, landings did hit a time series high in 2015 resulting in a significant overage in the federal ACL (Figure 2).

Commercial harvest of cobia has traditionally been a bycatch in the offshore snapper/grouper and trolling fisheries. Directed fisheries are generally precluded as a result of the low possession limits. The commercial fishery has seen an increasing trend from North Carolina through the mid-Atlantic over the time series. The AMG cobia commercial fishery closed early in 2014 (December 11, 2014). The 2015 overages would be deducted if the stock were overfished, however, given they are not overfished, the commercial quota for 20-16 will be 50,000 pounds (Figure 3).

Federal Management

The Cobia FMP is currently managed jointly in federal waters by the SAFMC and the GMFMC under the joint Coastal Migratory Pelagics Fishery Management Plan; the MAFMC participates through two voting seats on the SAFMC's Mackerel/Cobia Committee. The GMFMC sets the overall ALC for Gulf cobia and the measures to achieve that quota with the exception of the East coast of Florida. The East coast of Florida has a suballocation of the overall Gulf ACL; the percentage was determined jointly by the two councils in Amendment 20B. The suballocation is then split 92% recreational and 8% commercial. The SAFMC then sets management measures to achieve the quota. The ACL and measures to achieve the ACL for AMG cobia is set by the SAFMC.

The SAFMC is currently developing Framework Amendment 4 to the Fishery Management Plan for Coastal Migratory Pelagic Resources in the Gulf of Mexico and Atlantic Region (included in

briefing materials). The framework includes actions to modify recreational and commercial harvest limits, change the recreational fishing year and modify recreational accountability measures for Atlantic migratory group cobia in the exclusive economic zone (EEZ) from the Georgia/Florida line through the Mid-Atlantic region.

State Management

Florida

Recreational cobia landing on the East coast of Florida ranged from 274,276 to 761,440 pounds (avg. = 488,788 pounds) during the 2005-2015 time series (Table 1). Current regulations are a 33" fork length and a 1 per person or 6 per vessel (whichever is less) bag limit. Legal gear is limited to spears, gigs, hook and line, seine and cast net (Table 3).

Commercial cobia landings on the East coast of Florida ranged from 57,003 to 156,069 pounds (avg. = 88,278 pounds) during the 2007-2011 time series (Table 2).

Georgia

Recreational cobia landings in Georgia ranged from 3,358 to 257,690 pounds (avg. = 58,111 pounds) during the 2005-2015 time series (Table 1). Current regulations in Georgia are a 2 fish per person bag limit with a 33" FL size limit (Table 2).

Commercial landings in Georgia and South Carolina are low and values for the two states were combined from 2010-2015 to avoid confidentiality issues and averaged 3,867 pounds (Table 4).

South Carolina

Recreational cobia landings in South Carolina ranged from 3,565 to 268,677 pounds (avg. = 76,954 pounds) during the 2005-2015 time series (Table 1). Current regulations in South Carolina consist of seasonal and areal bag limits from 1 to 2, a regional spawning season closure in May, and 33" FL size limit (Table 3). Cobia are designated as gamefish in South Carolina.

North Carolina

Recreational cobia landings in North Carolina ranged from 66,258 to 630,373 pounds (avg. = 259,883 pounds) from 2005-2015 (Table 1). Current regulations in North Carolina consist of a 1 fish bag limit with a boat limit of 2 fish for private boats and 4 fish in the for-hire sector (private vessels may only retain cobia on Monday, Wednesday, and Saturday), 37" FL size limit, and a closure in state waters effective September 30, 2016 (Table 3).

Commercial landings in North Carolina ranged from 19,950-52,315 pounds from 2010-2015, averaging 37,559 pounds over the time series. The landings of 52,315 pounds in 2015 accounted for nearly the entire AMG cobia commercial quota in 2015 and would have exceeded the 2016 quota (Table 4).

Virginia

Recreational cobia landings in Virginia ranged from 36,409 to 733,740 pounds (avg. = 368,059 pounds) during the 2005-2015 time series (Table 1). Current regulations in Virginia consist of 1

fish bag limit and 2 fish per boat. A 40"TL size limit with no more than one greater than 50"TL, no gaffing permitted, state waters close on August 30, 2016 (Table 2).

Commercial landings for the mid-Atlantic region (Virginia, Maryland, New Jersey, New York) and Rhode Island are combined in Table 4 to avoid confidentiality issues in several Mid-Atlantic States. The majority of the mid-Atlantic landings come for Virginia. The average landings from 2010-2015 were 14,732 pounds.

Table 1. Recreational landings of Atlantic cobia from 2005-2015 in pounds. Data sources: MRIP and SEFSC

Year	Virginia	North Carolina	South Carolina	Georgia	Total AMG (VA-GA)	East Coast of Florida
2005	577,284	322,272	5,793	3,358	908,707	287,267
2006	733,740	104,259	101,018	4,824	943,841	493,334
2007	322,887	90,197	268,677	64,708	746,469	580,632
2008	167,949	66,258	50,108	257,690	542,006	438,621
2009	552,995	123,061	76,229	3,997	756,282	361,120
2010	232,987	561,486	65,688	79,855	940,015	745,228
2011	136,859	121,689	3,565	90,375	352,488	761,440
2012	36,409	68,657	224,365	105,193	434,623	370,373
2013	354,463	492,969	19,130	29,224	895,786	274,276
2014	214,427	277,489	31,927	20,642	544,485	582,423
2015	718,647	630,373	123,952	67,804	1,540,776	481,956

* There are no MRIP-estimated recreational landings of AMG cobia in states north of Virginia.

Table 2. Commercial cobia landings for Florida East Coast, 2007-2011 (pounds).

	Commercial Cobia landings
2007	60,805
2008	57,003
2009	65,953
2010	101,564
2011	156,069

Table 3. Recreational measures in 2016 for Virginia, North Carolina, South Carolina and Georgia.

State	Bag limit	Vessel limit	Size Limit (inches)	Legal Gear
Virginia	1 fish*	2 fish	40" TL, only 1 > 50" TL	
North Carolina	1 fish**	For-hire: 4/vessel or 1 person when less than 4 people on board Private: 2 fish on vessels with more than 1 person on board	37" FL	No gaffing permitted
South Carolina – north of Jeremy Inlet, Edisto Island	2 fish	None	33" FL	
South Carolina- south of Jeremy Inlet, Edisto Island	1 fish June 1- Apr 30 Catch and release only May 1-May 31	3 fish per vessel or 1 fish per person, whichever is lower	33" FL	
Georgia	2 fish	None	33" FL	
Florida	1 per person	1 per person or 6 per vessel, whichever is less	33" FL	spears, gigs, hook and line, seine, cast net

*VA State waters close 8/30/16.

**NC State waters close 9/30/16; private recreational can only retain cobia on Mondays, Wednesdays, and Saturdays.

Table 4. Commercial cobia landings (pounds) and revenues (2014 dollars) by state/area, 2010-2015.

Year	GA/SC	NC	Mid-Atlantic*	Total
Commercial Landing in Pounds				
2010	3,174	43,737	9,364	56,275
2011	4,610	19,950	9,233	33,793
2012	3,642	32,008	6,309	41,959
2013	4,041	35,496	13,095	52,632
2014	4,180	41,848	23,111	69,139
2015	3,555	52,315	27,277	83,148
Average	3,867	37,559	14,732	56,158
Dockside Revenues (2014 dollars)				
2010	\$11,377	\$70,377	\$19,976	\$101,730
2011	\$19,666	\$37,893	\$21,666	\$79,224
2012	\$15,554	\$66,887	\$14,597	\$97,038
2013	\$15,639	\$79,397	\$35,792	\$130,828
2014	\$13,320	\$95,462	\$67,972	\$176,754
2015	\$11,151	\$147,160	\$75,360	\$233,672
Average	\$14,451	\$82,863	\$39,227	\$136,541

Georgia and South Carolina landings are combined to avoid confidentiality issues. Source: SEFSC Commercial ACL Dataset (December 2015) for 2010-2014 data; D. Gloeckner (pers. comm., 2016) for 2015 data.

Mid-Atlantic states include Virginia, Maryland, New York, New Jersey.

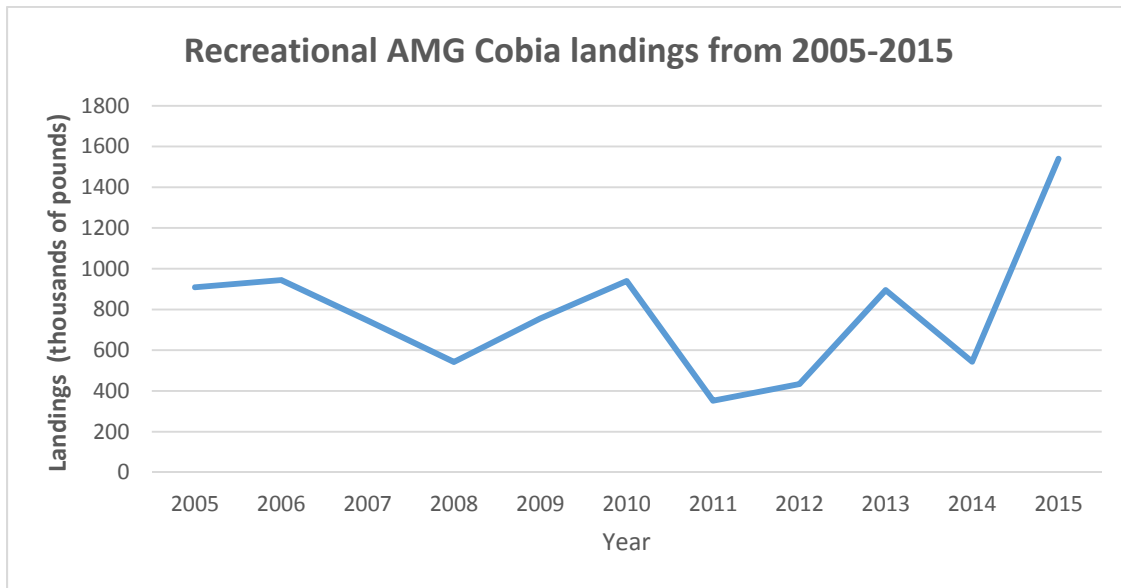


Figure 2. Recreational landings of AMG cobia (2005-2015)

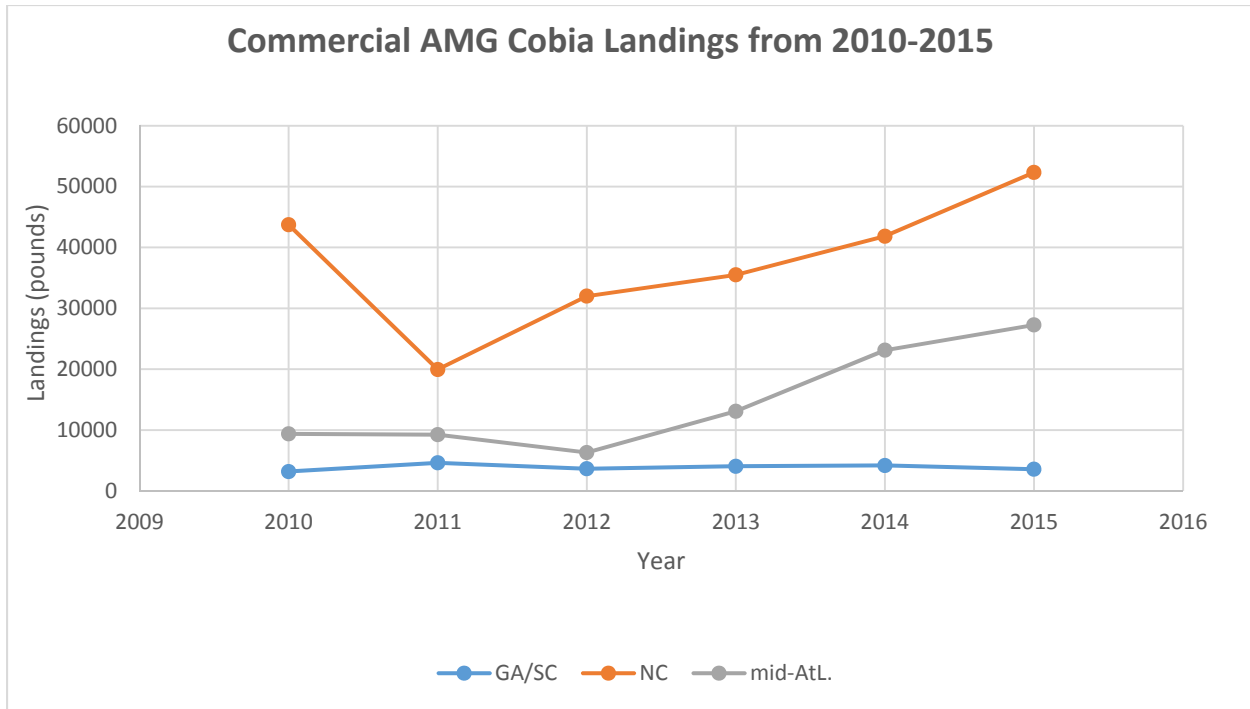


Figure 3. Commercial landings of AMG cobia (2010-2015)

Plan Development Options

The ISFMP Policy Board directed the Board to discuss whether to promulgate a cobia plan and, if so, recommend what form that plan would take at the May 2016 ASMFC meeting. Specifically, the ISFMP Policy Board requested consideration of alternatives for joint management, complementary management, and exclusive jurisdiction for the Commission.

Distinctions between various management scenarios have been developed and reviewed by the commission in the past. Essentially, the ASMFC has 3 types of Fishery Management Plans (FMP): a ASMFC FMP, a joint FMP, and a complementary FMP. A joint plan, like summer flounder in the mid-Atlantic, involves both the ASMFC Board and the Mid-Atlantic Fishery Management Council in the FMP process. A complementary plan, like spiny dogfish, separates the management processes between the two bodies (Federal/Council and ASMFC Board) and attempts to have measures that are consistent and not in direct conflict.

A. Management Plan Structure

Option 1:

ASMFC/SAFMC Complementary Fishery Management Plan

- ASMFC develops its own management documents. The ASMFC FMP can have aspects of the plan that are consistent with the Council but it is not required
- FMP development timeframe is consistent with ASMFC documents (addenda=6 to 8 months; Amendments 1.5 to 2 years)

- Not necessary to meet with SAFMC and act jointly
- Potential for lack of consistency between federal and state waters, which can result in fisherman fishing side-by-side under different regulations
- States are the responsible party for monitoring quotas in most cases
- States are the responsible party for closing state waters once quota is reached
- Stock assessments are conducted with the SEFSC/Council/Commission. The Science Center is the lead.

Option 2:

ASMFC/SAFMC Joint Fishery Management Plan

- ASMFC develops its management documents jointly with the Council. It is required to have the same management program for both state and federal waters.
- FMP development timeframe likely longer than a typical ASMFC document (addenda/framework=8 months to 1 year; Amendments 2-3 years)
- Meet with SAFMC and act jointly (must have like motions to proceed with actions)
- Can have additional administrative procedures due to federal laws and requirements (e.g. longer rule making process; Council makes recommendations which are reviewed and approved by NOAA Fisheries (SERO))
- NOAA Fisheries is the responsible party for monitoring quotas in most cases
- NOAA Fisheries closes federal waters and states close state waters when the quota has been reached
- Some flexibility for ASMFC-only management components
- Stock assessments are conducted with the SEFSC/Council/Commission. The Science Center is the lead.

Option 3:

ASMFC exclusive management

- ASMFC would develop its own management documents.
- FMP development timeframe is consistent with ASMFC documents (addenda=6 to 8 months; Amendments 1.5 to 2 years)
- States are the responsible party for monitoring quotas in most cases
- States are the responsible party for closing state waters once quota is reached
- States are the responsible party for data collection and analysis
- Commission is responsible for conducting stock assessments (with possible assistance of the SEFSC and SEDAR)

Option 4:

Status quo: The SAFMC and GMFMC would retain all current management authority of cobia through the Coastal Migratory Pelagics Fishery Management Plan, with the MAFMC participating through 2 voting seats.

B. ASMFC Board Formation

If the Commission takes action to create a cobia fishery management plan, it will need to determine if Cobia should reside as species within the South Atlantic State/Federal Fisheries Management Board or be an independent board.

Option 1: South Atlantic State-Federal Fisheries Management Board

The Board would be charged with developing a cobia FMP under its existing framework, with states not currently on the Board having the opportunity to declare an interest in cobia management as allowed in the Commission's Rules and Regulations. Landings are sparse north of Virginia and technical expertise primarily resides in the states from Virginia and south. The Board's multi-species advisory panel may preclude the need for a stand-alone advisory panel. Final FMP approval would be subject to the Commission.

Option 2: AMG Cobia Board

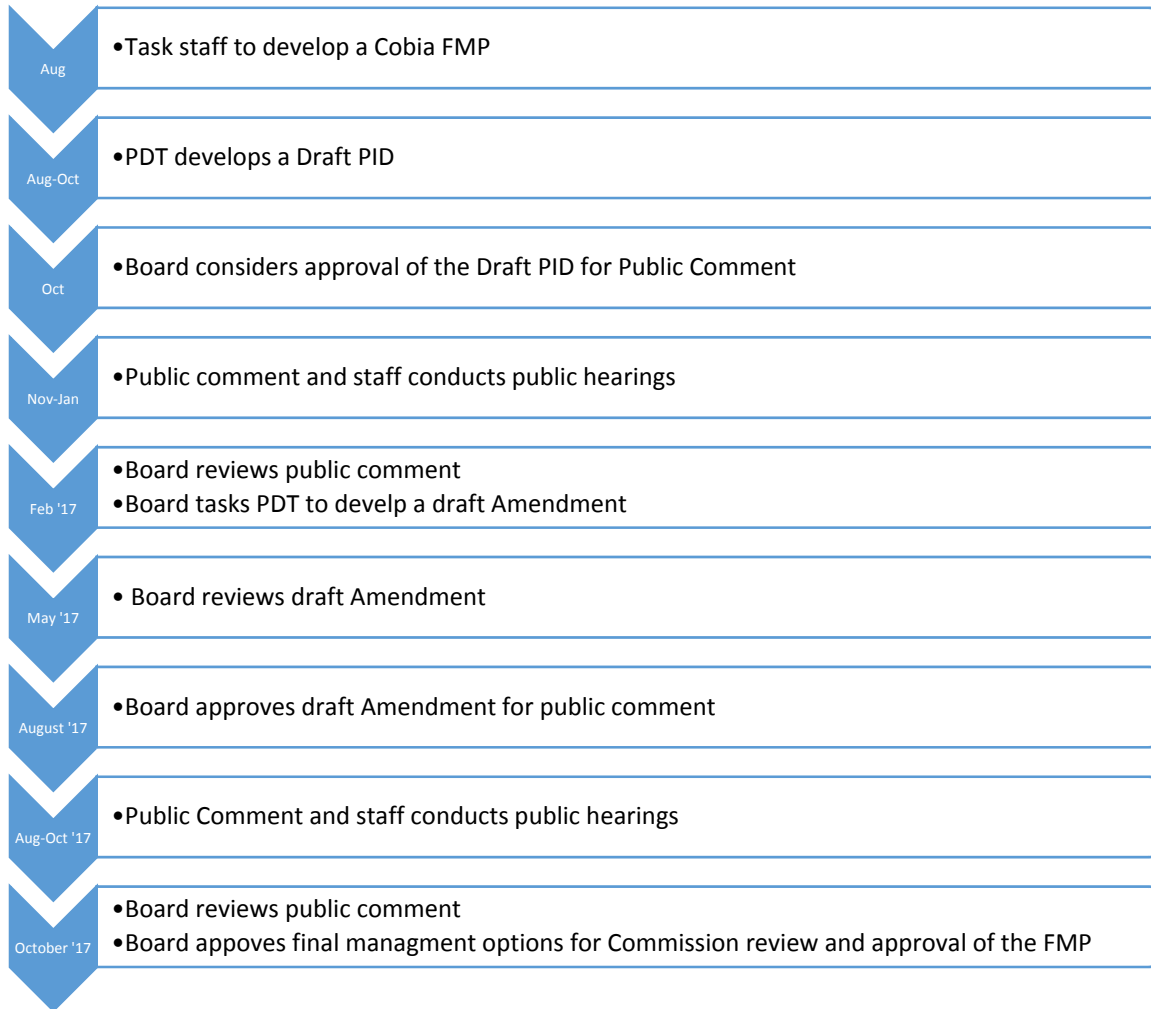
A stand-alone cobia board would be charged with developing a cobia FMP. Membership of the Board would consist of those states with a declared interest in cobia as set in the Commission's Rules and Regulations. Under the provisions of the ISFMP Charter, the Commission could extend a voting seat to the SAFMC if recommended by the Cobia Board. Final FMP approval would be subject to the Commission.

Option 3: Split the South Atlantic Board

The South Atlantic Board could consider splitting the Board and having two or more species boards. One of those boards would be charged with developing a cobia FMP. Any state not currently on the Board (after the split) would have the opportunity to declare an interest in cobia management as allowed in the Commission's Rules and Regulations. Under the provisions of the ISFMP Charter, the Commission could extend a voting seat to the SAFMC if recommended by the Cobia Board. Final FMP approval would be subject to the Commission.

Time Line for Development of a Cobia FMP

ASMFC Cobia FMP



ASMFC Cobia Complementary FMP

Same timeline as above but would report progress to the SAFMC at their meetings. The above time line could be delayed a few months depending on the timing of Commission and Council meetings.

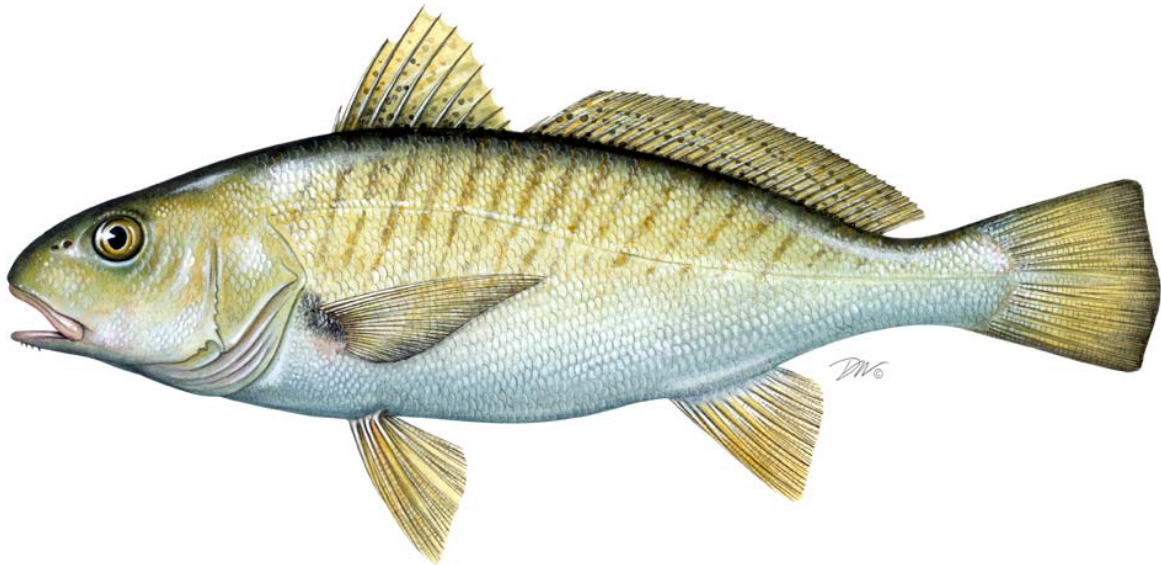
Joint ASMFC/SAFMC FMP

A joint FMP with the SAFMC would take at least two years to develop and finalize. All actions would have to occur at a joint meeting of both the Council and Commission. Any joint action would have to comply with federal guidelines and requirements (e.g. Magnuson-Stevens Act, NEPA, APA).

2016 REVIEW OF THE
ATLANTIC STATES MARINE FISHERIES COMMISSION
FISHERY MANAGEMENT PLAN FOR

ATLANTIC CROAKER
(Micropogonias undulatus)

2015 FISHING YEAR



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I. Status of the Fishery Management Plan

<u>Date of FMP Approval:</u>	Original FMP – October 1987
<u>Amendments:</u>	Amendment 1 – November 2005 (implemented January 2006) Addendum I – March 2011 Addendum II – August 2014
<u>Management Areas:</u>	The Atlantic coast distribution of the resource from New Jersey through Florida
<u>Active Boards/Committees:</u>	South Atlantic State/Federal Fisheries Management Board; Atlantic Croaker Technical Committee, Stock Assessment Subcommittee, and Plan Review Team; South Atlantic Species Advisory Panel

The Fishery Management Plan (FMP) for Atlantic Croaker was adopted in 1987 and included the states from Maryland through Florida (ASMFC 1987). In 2004, the South Atlantic State/Federal Fisheries Management Board (Board) found the recommendations in the FMP to be vague, and recommended that an amendment be prepared to define management measures necessary to achieve the goals of the FMP. The Interstate Fisheries Management Program Policy Board also adopted the finding that the original FMP did not contain any management measures that states were required to implement.

In 2002, the Board directed the Atlantic Croaker Technical Committee to conduct the first coastwide stock assessment of the species to prepare for developing an amendment. The Atlantic Croaker Stock Assessment Subcommittee developed a stock assessment in 2003, which was approved by a Southeast Data Assessment Review (SEDAR) panel for use in management in June 2004 (ASMFC 2005a). The Board quickly initiated development of an amendment and, in November 2005, approved Amendment 1 to the Atlantic Croaker FMP (ASMFC 2005b). The amendment was fully implemented by January 1, 2006.

The goal of Amendment 1 is to utilize interstate management to perpetuate the self-sustainable Atlantic croaker resource throughout its range and generate the greatest economic and social benefits from its commercial and recreational harvest and utilization over time. Amendment 1 contains four objectives:

- 1) Manage the fishing mortality rate for Atlantic croaker to provide adequate spawning potential to sustain long-term abundance of the Atlantic croaker population.
- 2) Manage the Atlantic croaker stock to maintain the spawning stock biomass above the target biomass levels and restrict fishing mortality to rates below the threshold.
- 3) Develop a management program for restoring and maintaining essential Atlantic croaker habitat.
- 4) Develop research priorities that will further refine the Atlantic croaker management program to maximize the biological, social, and economic benefits derived from the Atlantic croaker population.

Amendment 1 expanded the management area to include the states from New Jersey through Florida. Consistent with the stock assessment completed in 2004, the amendment defined two Atlantic coast management regions: the south-Atlantic region, from Florida through South Carolina; and the mid-Atlantic region, from North Carolina through New Jersey.

Amendment 1 established biological reference points (BRPs) to define an overfished and overfishing stock status for the mid-Atlantic region only. Reliable stock estimates and BRPs for the South Atlantic region could not be developed during the 2004 stock assessment due to a lack of data. The BRPs were based on maximum sustainable yield (MSY), and included threshold and target levels of fishing mortality (F) and spawning stock biomass (SSB): F threshold = F_{MSY} (estimated to be 0.39); F target = $0.75 \times F_{MSY}$ (estimated to be 0.29); SSB threshold = $0.7 \times SSB_{MSY}$ (estimated to be 44.65 million pounds); and SSB target = SSB_{MSY} (estimated to be 63.78 million pounds). An SSB estimate below the SSB threshold resulted in an overfished status determination, and an F estimate above the F threshold resulted in an overfishing status determination. The Amendment established that the Board would take action, including a stock rebuilding schedule if necessary, should the BRPs indicate the stock is overfished or overfishing is occurring.

Amendment 1 did not require any specific measures restricting recreational or commercial harvest of Atlantic croaker. States with more conservative measures were encouraged to maintain those regulations (Table 1). The Board was able to revise Amendment 1 through adaptive management, including any regulatory and/or monitoring requirements in subsequent addenda, along with procedures for implementing alternative management programs via conservation equivalency.

The Board initiated Addendum I to Amendment I at its August 2010 meeting, following the updated stock assessment, in order to address the proposed reference points and management unit. The stock assessment evaluated the stock as a coastwide unit, rather than the two management units established within Amendment I. In approving Addendum I, the Board endorsed consolidating the stock into one management unit, as proposed by the stock assessment. In addition, Addendum I established a procedure, similar to other species, by which the Board may approve peer-reviewed BRPs without a full administrative process, such as an amendment or addendum.

In August 2014, the Board approved Addendum II to the Atlantic Croaker FMP. The Addendum established the Traffic Light Approach (TLA) as the new precautionary management framework to evaluate fishery trends and develop management actions. The TLA was originally developed as a management tool for data poor fisheries. The name comes from assigning a color (red, yellow, or green) to categorize relative levels of population indicators. When a population characteristic improves, the proportion of green in the given year increases. Harvest and abundance thresholds of 30% and 60% were established in Addendum II, representing moderate and significant concern for the fishery. If thresholds for both population characteristics achieve or exceed a threshold for a three year period, then management action is enacted.

The TLA framework replaces the management triggers stipulated in Addendum I, which dictated that action should be taken if recreational and commercial landings dropped below 70% of the previous two year average. Those triggers were limited in their ability to illustrate long-term

declines or increases in stock abundance. In contrast, the TLA approach better illustrates trends in the fishery through changes in the proportion of green, yellow, and red coloring.

Addenda I and II did not add or change any management measures or requirements. The only existing requirement is for states to submit an annual compliance report by July 1st of each year that contains commercial and recreational landings as well as results from any monitoring programs that intercept Atlantic croaker.

II. Status of the Stock

Stock status is based on data and results of the 2010 stock assessment (ASMFC 2010). Results include revised biological reference points (below), which are ratio-based and apply to the entire coastwide resource (unlike those in Amendment 1). Overfishing is occurring if F/F_{MSY} is greater than 1 and the stock is considered overfished if $SSB/(SSB_{MSY}(1-M))$ is less than 1.

	Overfishing Definition	Overfished Definition
Target	$F/(F_{MSY} * 0.75) = 1$	$SSB/SSB_{MSY} = 1$
Threshold	$F/F_{MSY} = 1$	$SSB/(SSB_{MSY}(1-M)) = 1$

Atlantic croaker is not experiencing overfishing. According to the 2010 stock assessment, biomass has been increasing and fishing mortality decreasing since the late 1980s. Biomass conclusions are based on information from the data compiled for the assessment, namely increasing indices of relative abundance and expanding age structure in the catch and indices. Model estimated values of fishing mortality (F), spawning stock biomass (SSB), and biological reference points are too uncertain to be used to determine stock status. However, the ratio of F to F_{MSY} (the F needed to produce maximum sustainable yield) is reliable and can be used to determine that overfishing is not occurring. It is not possible to be confident with regard to stock status, particularly a biomass determination, until the discards of Atlantic croaker from the South Atlantic shrimp trawl fishery can be adequately estimated and incorporated into the stock assessment.

Absolute estimates of total F are unavailable because of model uncertainty; however, the general trend in total F from the model is considered reliable due to support from the data. The trend in total F decreases substantially during the first five years of the time series (1988-1992) and shows an overall decline over the remainder of the time series, except for occasional, brief spikes (Figure 1). Retrospective analysis of the model showed that estimates of F decreased as more years of data were used. A series of sensitivity runs conducted over a range of plausible values of shrimp-trawl fishing mortality found that the ratio of directed fishing mortality to F_{MSY} was less than one in all cases, indicating overfishing was not occurring.

Again, absolute estimates of SSB are unavailable because of model uncertainty; however, the general trend in SSB from the model is considered reliable due to support from the data. Spawning stock biomass shows a nearly consistent increasing trend since 1998 (Figure 2). Sensitivity runs of the model, including rough estimates of shrimp trawl discards, do not change the overall trend in SSB. Retrospective analysis of the model showed that estimates of SSB increased as more years of data were used.

Recruitment, estimated in the model as age-1 abundance, has been variable but generally increasing over the time series. Figure 2 shows the trend in recruitment; absolute values are omitted because of uncertainty in abundance estimates. The model estimated the production of strong year classes in 1997, 2001, and 2007.

III. Status of the Fishery

Total Atlantic croaker harvest from New Jersey through the east coast of Florida in 2015 is estimated at 9.47 million pounds (Tables 2 and 3, Figure 3). This represents a 77% decline in total harvest since the peak of 41.2 million pounds in 2001 (77% commercial decline, 77% recreational decline). The commercial and recreational fisheries harvested 73% and 27% of the total, respectively. The vast majority of landings are from the Mid-Atlantic region (96% in 2015), and the recent decline in total landings is a result of both commercial and recreational landings declines in that region, although some states showed increases in either or both sectors (Figure 4). Commercial and recreational landings in the South Atlantic region have been generally stable over the last decade; however, 2010 showed large decreases in the South Atlantic states' recreational harvests, followed by a slow general increase in recreational harvest in this region. Recreational and commercial harvests in the South Atlantic region rose to 4.0% of coastwide harvest in 2015 from 0.6% in 2010.

Atlantic coast commercial landings of Atlantic croaker exhibit a cyclical pattern, with low domains in the 1960s to early 1970s and the 1980s to early 1990s, and high domains in the mid-to-late 1970s and the mid-1990s to early 2000s (Figure 3). Commercial landings increased from a low of 3.7 million pounds in 1991 to 30.1 million pounds in 2001 (Table 2); however, landings have declined consistently since 2003 to 6.9 million pounds in 2015, which registers below the 1960-2015 average of 13.33 million pounds. Within the management unit, the majority of 2015 commercial landings came from Virginia (66%) and North Carolina (26%). Maryland had the next highest level, with 4% of coastwide landings.

From 1981-2015, recreational landings of Atlantic croaker from New Jersey through Florida have varied between 2.8 million fish (1.3 million pounds) and 13.2 million fish (11.1 million pounds; Tables 3 and 4, Figure 5). Landings generally increased until 2001, held stable from 2001-2006 before exhibiting a declining trend from 2007 through 2015. The 2015 landings are estimated at 5.5 million fish and 2.5 million pounds. Virginia was responsible for 61% of the 2015 recreational landings, in numbers of fish, followed by Maryland (12%), and North Carolina and Florida (8.5% and 8.1%, respectively).

The number of recreational releases increased over the time series until 2008, when numbers released began to generally decline (Figure 5). However, percentage of released recreational catch continued to increase to a peak of 65% in 2013. In 2015, anglers released approximately 7.6 million fish, a decline from the 13.8 million fish released in 2013. Anglers released an estimated 58% of the croaker catch in 2015 (Figure 5).

IV. Status of Assessment Advice

A statistical catch-at-age (SCA) model was used in the last Atlantic croaker stock assessment (ASMFC 2010). This model combines catch-at-age data from the commercial and recreational fisheries with information from fishery-independent surveys and biological information such as

growth rates and natural mortality rates to estimate the size of each age class and the exploitation rate of the population. The assessment was peer reviewed by a panel of experts in conjunction with the Southeast Data, Assessment, and Review (SEDAR) process.

The Review Panel was unable to support some of the assessment results due to uncertainty regarding the estimation of Atlantic croaker discards in the shrimp trawl fishery, and the application of estimates in modeling. Specifically, model-estimated values of stock size, fishing mortality, and biological reference points are too uncertain for use; however, the trends in model-estimated parameters and ratio-based fishing F reference points are considered reliable. Adequate discard estimates cannot be developed from currently available data, and assessments of Atlantic croaker will be unreliable until adequate estimates are properly incorporated into modeling. Despite the uncertainty in assessment results caused by shrimp trawl bycatch, the Review Panel concluded that it is unlikely that the stock is in trouble. The stock is not experiencing overfishing, biomass has been trending up, commercial catches are stable, and discards from the shrimp trawl fishery have been much reduced.

In conjunction with recommending the TLA for Atlantic croaker in 2014, the Plan Review Team also recommended the species for a stock assessment. The next benchmark stock assessment was initiated in the fall of 2015 and is currently underway in 2016.

V. Status of Research and Monitoring

There are no research or monitoring programs required of the states except for the submission of an annual compliance report. The following fishery-dependent (other than catch and effort data) and fishery-independent monitoring programs were reported in the 2016 compliance reports.

Fishery-Dependent Monitoring

- New Jersey: initiated biological monitoring of commercially harvested Atlantic croaker in 2006 in conjunction with ACCSP (2015 n=170)
- Maryland: commercial pound net fishery biological sampling (942 length measurements, 127 samples aged in 2015, first year that no sampled fish were older than age seven); Maryland Charter Boat CPUE (1993-present; 2015 catch was a time-series low of 36,601 fish).
- Delaware: collects trip-based information on pounds landed, area fished, effort, and gear type data through mandatory monthly state logbook reports submitted by fishermen.
- PRFC: has a mandatory commercial harvest daily reporting system, with reports due weekly.
- Virginia: commercial fishery biological sampling (8,649 length measurements, 8,632 weight measurements, 357 otolith ages, and 490 sex determinations in 2015)
- North Carolina: commercial fishery biological sampling since 1982 for length (2015 n=9,172), weight, otolith, sex determination, and reproductive condition.
- South Carolina: recreational fishery biological sampling via SCDNR State Finfish Survey, MRIP, and a SCDNR-managed mandatory trip reporting system for licensed charter boat operators. In 2013, SCDNR took over its portion of MRIP data collection.
- Georgia: collects biological information, including length, sex, and maturity stage, through the Marine Sportfish Carcass Recovery Project (8 fish in 2015)
- Florida: commercial fishery biological sampling (6 length measurements in 2015)

Fishery-Independent Monitoring

- New Jersey: 3 nearshore ocean (within 12 nm) juvenile trawl surveys (New Jersey Ocean Trawl Survey 1988-present; 2015 CPUE well below time-series average; nearshore Delaware Bay juvenile trawl survey (1991-present; 2015 survey index was well below time series average); Delaware River juvenile seine survey (1980-present; 2015 survey index was below time series average but above 2013 value)
- Delaware: offshore Delaware Bay adult finfish trawl survey (1990-present; 2015 #/tow = 3.18; 28% increase in relative abundance from 2014 index, below mean and median for time series); nearshore Delaware Bay juvenile finfish trawl survey (1980-present; 2015 index increased from 1.16 in 2013 to 8.48; Inland Bays index increased from 1.83 in 2013 to 3.22 in 2014, before dropping to 1.19 in 2015).
- Maryland: summer gill net survey was initiated in 2013 on lower Choptank (steady decline in catch; 476 fish in 2013, 269 in 2014, and 21 in 2015); Atlantic coast bays juvenile otter trawl survey (standardized from 1989-present; 2015 GM of 0.49 fish/hectare below time series mean of 1.62); Chesapeake Bay juvenile trawl index (standardized from 1989-present; 2015 CPUE decreased from 3.76 in 2012 to 0.21 in 2015).
- Virginia: Independent monitoring results are not yet available for the 2015 fishing year. VIMS Juvenile Finfish and Blue Crab Trawl Survey (1988-present; 2014 index representing the 2013 year class was 1.550, which is down from the 2013 value of 16.6655.)
- North Carolina: Pamlico Sound juvenile trawl survey (1987-present; 2015 juvenile abundance index (mean number of individuals/tow) was 271, below the time series average)
- South Carolina: estuarine electroshock survey for juveniles (2001-present; 2015 CPUE increased slightly since 2014, after a sharp drop in 2013); SEAMAP shallow water (15-30 ft) trawl survey from Cape Hatteras to Cape Canaveral (1989-present; 2015 CPUE increased by 174% from 2014); inshore estuarine trammel net survey for adults (May-September, 1991-present; 2015 CPUE increased 20.3% from 2014); SCECAP estuarine trawl survey (1999-present, primarily targets juveniles, CPUE is the lowest since 2009).
- Georgia: Marine Sportfish Population Health Survey (trammel and gill net surveys in the Altamaha River Delta and Wassaw estuary, 2002-present; 2015 n=168); Ecological Monitoring Survey (trawl, 2003-present; 2015 n=19,214; CPUE increased from 40.62 in 2014 to 55.53 in 2015).
- Florida: juvenile seine survey (2002-present; 2015 index continued variable trend with a decrease from 2014); juvenile trawl survey (2002-present; 2015 index continued variable trend with a decrease from 2014); adult haul seine survey (2001-present; 2015 index value is the highest since 2011)

The Northeast Fishery Science Center performs a randomly stratified groundfish survey along the U.S. east coast. Atlantic croaker are one of the main species caught throughout much of the survey area and, since the surveys started in 1972, it provides a long term data set. Regionally, mean CPUE (catch-per-unit-effort) of Atlantic croaker has increased from north to south. Since 1994, there has been an increase in annual catch variability. Catch levels in 2015 increased 49.8% from 2014 and were above the long term mean.

The Northeast Area Monitoring and Assessment Program (NEAMAP) also conducts nearshore trawl surveys from Cape Cod, MA to Cape Hatteras, NC. NEAMAP grew out of an ASMFC resolution in October 1997 to begin the development of a coordinated fishery-independent sampling program in the Northeast. The program began in 2006 with a pilot study and instituted a spring and fall survey in 2008. The surveys target both juvenile and adult fishes, including croaker. The resulting adult Atlantic croaker abundance index indicates a stable trend in croaker from 2007-2014, with one notable large peak in 2012. Due to the short length in the time series, this index was not used in the ongoing 2015 benchmark stock assessment, but will be considered in future stock assessments.

VI. Status of Management Measures and Issues

Fishery Management Plan

Amendment 1 was fully implemented by January 1, 2006, and provided the management plan for the 2009 fishing year. There are no interstate regulatory requirements for Atlantic croaker. Should regulatory requirements be implemented in the future, all state programs must include law enforcement capabilities adequate for successfully implementing the regulations. Addendum I to Amendment 1 was initiated in August 2010 and approved in March 2011, in order to 1) revise the biological reference points to be ratio-based, and 2) remove the distinction of two regions within the management unit, based on the results of the 2010 stock assessment. Addendum II was approved August 2014 and established the TLA management framework for Atlantic croaker in order to better illustrate long-term trends in the fishery.

Traffic Light Approach

Addendum II established the TLA as the new management framework for Atlantic croaker. Under this management program, if thresholds for both population characteristics (harvest and adult abundance) achieve or exceed the proportion of threshold for the specified three year period, management action will be taken. No TLA analysis has been conducted for the 2015 fishing year, as the benchmark stock assessment for Atlantic croaker is currently underway. Addendum II states that the TLA is intended as an interim management measure in years between benchmark stock assessments. Therefore, the most recent analysis is described below.

Analysis of the harvest composite index for 2014 shows that this population characteristic tripped for a second consecutive year (Figure 6). The mean proportion of red color from 2012-2014 was 44.5%, well above the 30% threshold. The harvest composite index was comprised of commercial and recreational landings. Both commercial and recreational indices would have individually tripped in 2014 at the 30% level. The TLA for commercial landings was above the 60% threshold for the second consecutive year in 2014.

The abundance composite TLA index was broken into two components based on age composition. The adult composite index was generated from the NMFS and SEAMAP surveys, since the majority of Atlantic croaker captured in those surveys were ages 1+. The juvenile composite index was generated from the NC program 195 and VIMS surveys because these two captured primarily young-of-the-year Atlantic croaker.

All four TLA composite abundance indices showed declines in 2014 with red occurring in all but one (NC 195) index. The adult composite TLA characteristic (Figure 7) did not trigger in 2014 with only a 14.2% red proportion and no red in the two previous years. The juvenile composite characteristic index (Figure 8) also did not trip in 2014; however, this is due to high index values in 2012 and 2013. In 2014, the juvenile composite index had a red proportion above the 30% threshold, due to a precipitous drop in the VIMS index. The higher annual variability for the different color proportions in the juvenile composite characteristic, in comparison to the adult composite characteristic, is likely a reflection annual recruitment variability rather than population trends.

Overall, management triggers were not tripped in 2014 since both population characteristics (harvest and abundance) were not above the 30% threshold for the 2012-2014 time period. Nonetheless, the analysis shows declining trends in the fishery independent indices as well as the commercial and recreational harvests of Atlantic croaker.

De Minimis Requests

States are permitted to request *de minimis* status if, for the preceding three years for which data are available, their average commercial landings or recreational landings (by weight) constitute less than 1% of the coastwide commercial or recreational landings for the same three year period. A state may qualify for *de minimis* in either its recreational or commercial sector, or both, but will only qualify for exemptions in the sector(s) that it qualifies for as *de minimis*. Amendment 1 does not include any compliance requirements other than annual state reporting, which is still required of *de minimis* states, thus *de minimis* status does not exempt states from any measures.

In the annual compliance reports, the following states requested *de minimis* status: Delaware (commercial fishery), South Carolina (commercial fishery), Georgia (commercial and recreational fisheries), and Florida (commercial fishery). The commercial and recreational *de minimis* criteria for 2015 are based on 1% of the average coastwide 2013-2015 landings in each fishery: 79,670 pounds for the commercial fishery and 31,999 pounds for the recreational fishery. The Delaware commercial fishery qualifies for *de minimis* status with an average of 6,774 pounds. The South Carolina commercial fishery qualifies for *de minimis* status with an average of 106 pounds. The Georgia commercial and recreational fisheries qualify for *de minimis* status with averages of zero and 29,135 pounds, respectively. The Florida commercial fishery qualifies for *de minimis* status with an average of 51,162 pounds.

Changes to State Regulations

Beginning June 1, 2015, North Carolina enacted a requirement for shrimp fishermen to use an additional bycatch reduction device (BRD), so that trawl nets are configured with two BRDs. This requirement may affect the bycatch of Atlantic croaker in North Carolina state waters.

Atlantic Croaker Habitat

The ASMFC Habitat Committee is currently preparing a Sciaenid Habitat Source Document which outlines the habitat needs of Atlantic croaker at different life stages (egg, larval, juvenile, adult). The report also highlights threats and uncertainties facing these ecological areas and identifies

Habitat Areas of Particular Concern. It is expected that the Sciaenid Habitat Source Document will be available by the end of 2016.

Bycatch Reduction

Atlantic croaker is subject to both direct and indirect fishing mortality. Historically, croaker ranked as one of the most abundant bycatch species of the south Atlantic shrimp trawl fishery, resulting in the original FMP's recommendation that bycatch reduction devices (BRDs) be developed and required in the shrimp trawl fishery. Since then, the states of North Carolina through Florida have all enacted requirements for the use of BRDs in shrimp trawl nets in state waters, reducing croaker bycatch from this fishery (ASMFC 2010). However, bycatch and discard monitoring from the shrimp trawl fishery is inadequate, resulting in a major source of uncertainty for assessing this stock, as well as other important Mid- and South Atlantic species. Most of the discarded croaker are age-0 and thus likely have not yet reached maturity (ASMFC 2010). The North Carolina Division of Marine Fisheries conducted a two-year study, published in 2015, to collect bycatch data from state shrimp trawlers. It found that Atlantic croaker represent between 34-49% of the total observed finfish bycatch by weight in estuarine waters and between 20-42% in ocean waters. The at-net mortality for Atlantic croaker was found to be 23% (Brown 2015). These data will be valuable for incorporating estimates of removals in the next stock assessment.

Atlantic croaker are also discarded from other commercial fishing gears, primarily due to market pressures and few restrictions on croaker harvest at the state level. The NMFS Pelagic Observer Program provides data to estimate these discards for use in assessments; however, the time series is limited and only discards from gill nets and otter trawls could be estimated for the last assessment based on the available data. Since 1988, estimated discards have fluctuated between 94 and 15,176 mt without trend, averaging 2,503 mt (ASMFC 2010).

Atlantic croaker is also a major component of the scrap/bait fishery. Landings from this fishery are not reported at the species level, except in North Carolina, which has a continuous program in place to sample these landings and enable estimation of croaker scrap landings for use in the stock assessment. As part of the recent stock assessment, North Carolina estimated the scrap/bait landings, which have declined in recent years, from a high of 1,569 mt in 1989 to a low of 84 mt in 2008, primarily due to restrictions placed on fisheries producing the highest scrap/bait landings (ASMFC 2010). Regulations instituted by North Carolina include a ban on flynet fishing south of Cape Hatteras, incidental finfish limits for shrimp and crab trawls in inside waters, minimum mesh size restrictions in trawls, and culling panels in long haul seines.

South Carolina has also begun a state monitoring program to account for scrap landings. The state initiated a bait harvester trip ticket program for all commercial bait harvesters licensed in South Carolina. The impetus for this program is to track bait usage of small sciaenid species (croaker, spot, and whiting) as well as other important bait species.

Several states have implemented other commercial gear requirements that further reduce bycatch and bycatch mortality, while others continue to encourage the use of the BRD devices. NOAA Fisheries published a notice on June 24, 2011 for public scoping in the Federal Register to expand the methods for reducing bycatch interactions with sea turtles, which may have additional effects

on the bycatch of finfish like Atlantic croaker in trawls (76 FR 37050). Continuing to reduce the quantity of sub-adult croaker harvested should increase spawning stock biomass and yield per recruit.

Atlantic croaker are also subject to recreational discarding. The percentage of Atlantic croaker released alive by recreational anglers has generally increased over time. Discard mortality was estimated to be 10% for the last stock assessment (ASMFC 2010). The use of circle hooks and appropriate handling techniques can help reduce mortality of released fish.

VII. Implementation of FMP Compliance Requirements for 2015

The PRT finds that all states have fulfilled the requirements of Amendment 1.

VIII. Recommendations

Management and Regulatory Recommendations

- Encourage the use of circle hooks to minimize recreational discard mortality.
- Consider approval of the *de minimis* requests from Delaware, South Carolina, Georgia, and Florida.
- Consider the basic research and monitoring information needed for informed management in light of the budgetary constraints limiting all state governments.

Research and Monitoring Recommendations

High Priority

- Develop and implement compatible and coordinated sampling programs for the South Atlantic shrimp trawl fishery in order to monitor and characterize Atlantic croaker bycatch in this fishery.
- Continue fisheries-independent surveys throughout the species range, with increased focus on collecting subsamples in the southern range.
- Encourage fishery-dependent biological sampling, with increased focus in the southern range and expanding the commercial and recreational fishery samples to afford a full age-length key
- Determine migratory patterns and mixing rates through cooperative, multi-jurisdictional tagging studies; further study the relative degree of genetic separation between fish in the northern and southern range of the species; and continue research and analysis of otolith microchemistry data.
- Collect bio-profile information and conduct studies on growth rates, age structure, estimates of fecundity, and maturity schedule throughout the species range with a standardized protocol.
- Evaluate bycatch and discard estimates from commercial and recreational fisheries, and extend coverage of scrap fishery sampling to other states.
- Develop fishery-independent size, age, and sex specific relative abundance estimates to monitor long-term changes in croaker abundance.
- Maintain funding for current surveys and monitoring to provide needed information for stock monitoring and assessment.

Medium Priority

- Develop age-size data that are representative of all seasons and areas in the fisheries on an annual basis.
- Improve catch and effort statistics from the commercial and recreational fisheries and develop more rigorous methods to standardize catch-per-unit-effort.
- Collect data on fishing attributes necessary to develop gear-type-specific fishing effort estimates.
- Evaluate commercial and recreational mortality under varying environmental factors and fishery practices and include in updated assessment.
- Update studies on the effectiveness of bycatch reduction devices (BRDs) in reducing croaker bycatch.
- Validate otolith aging methods with appropriate methods, e.g., tagging, chemical marking.
- Evaluate the optimum utilization (economic and biological) of a long-term fluctuating population such as croaker.
- Identify essential habitat requirements.
- Determine species interactions and predator/prey relationships for croaker (prey) and other more highly valued fisheries (predators).
- Determine the impacts of any dredging activity (i.e. for beach re-nourishment) on all life history stages of croaker.
- Investigate environmental covariates in stock assessment models.
- Examine socio-economic aspects of the fishery.
- Re-examine historical ichthyoplankton studies of the Chesapeake Bay for an indication of the magnitude of estuarine spawning.

IX. References

- Atlantic States Marine Fisheries Commission (ASMFC). 1987. Fishery Management Plan for Atlantic Croaker. Washington (DC): ASMFC. Fishery Management Report No. 10. 90 p.
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X. Figures

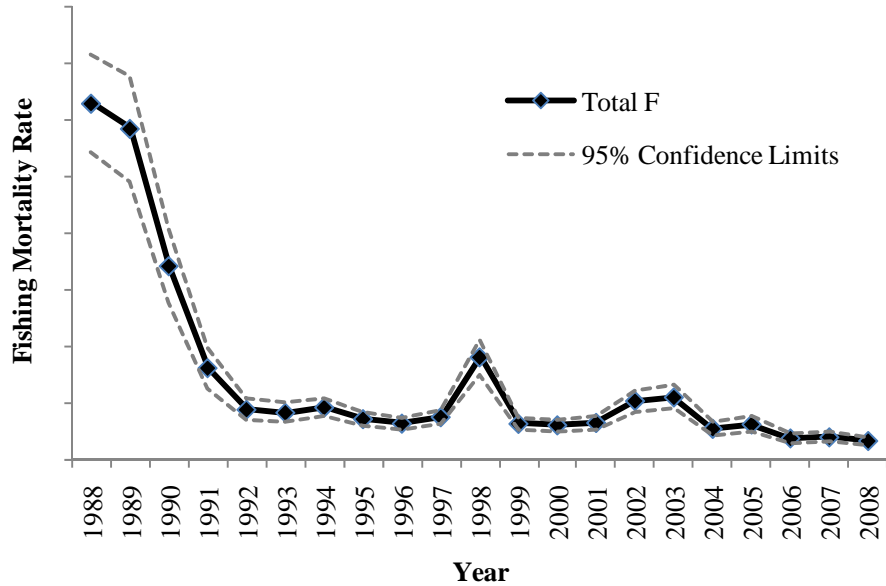


Figure 1. Trend in estimated total fishing mortality rate (F) of Atlantic croaker (Absolute estimates of F are unreliable due to uncertainty regarding the estimation of Atlantic croaker discards in the shrimp trawl fishery, and the application of estimates in modeling. Source: ASMFC 2010.)

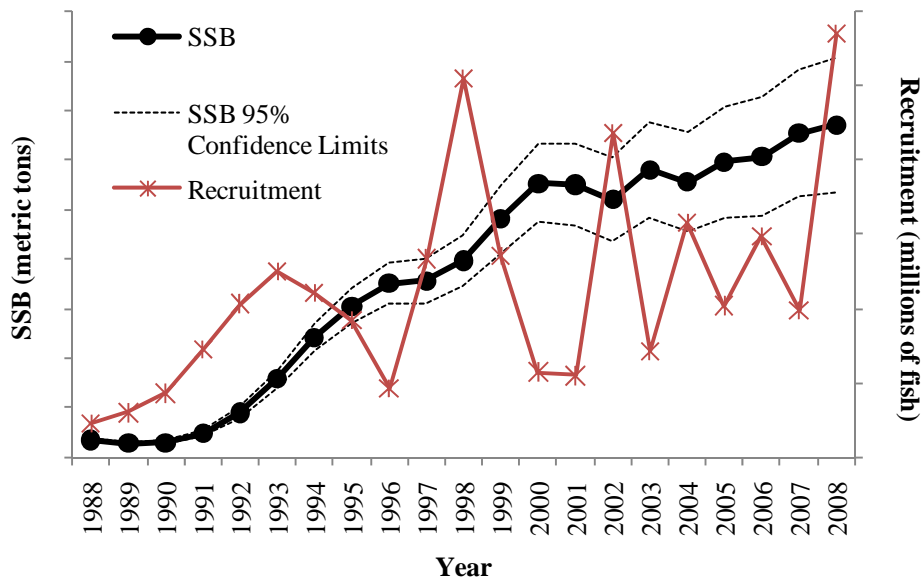


Figure 2. Trends in estimated spawning stock biomass (SSB, metric tons) and age-1 recruitment (numbers of fish) of Atlantic croaker (Absolute estimates of stock size are unreliable due to uncertainty regarding the estimation of Atlantic croaker discards in the shrimp trawl fishery, and the application of estimates in modeling. Source: ASMFC 2010.)

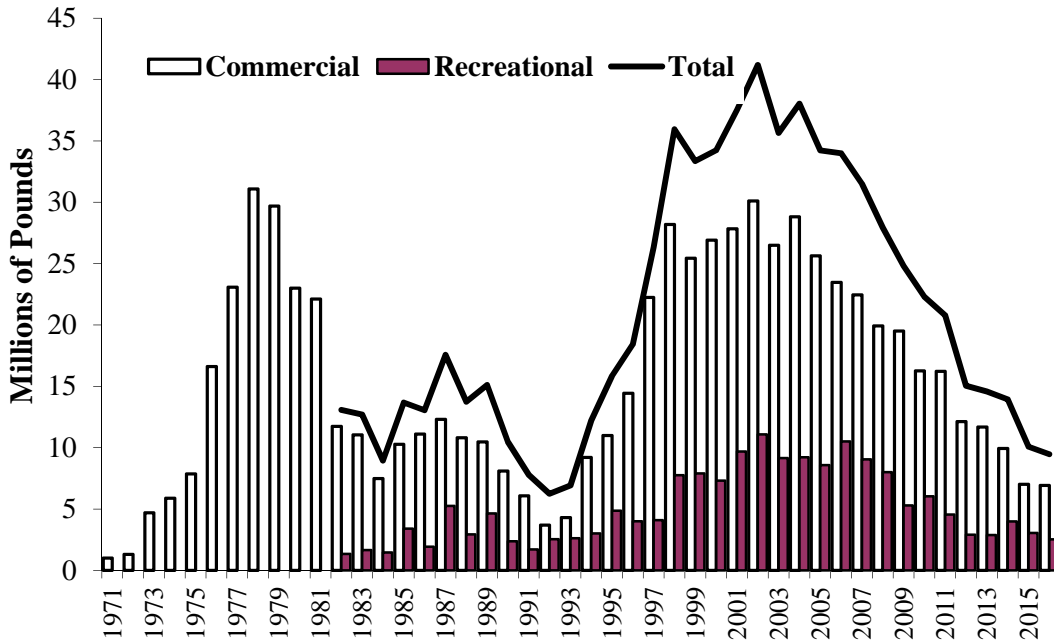


Figure 3. Atlantic croaker commercial, recreational, and total landings (pounds)
 (See Tables 2 and 3 for values and source information. Commercial landings estimate for 2015 is preliminary. Reliable recreational landings estimates are not available before 1981.)

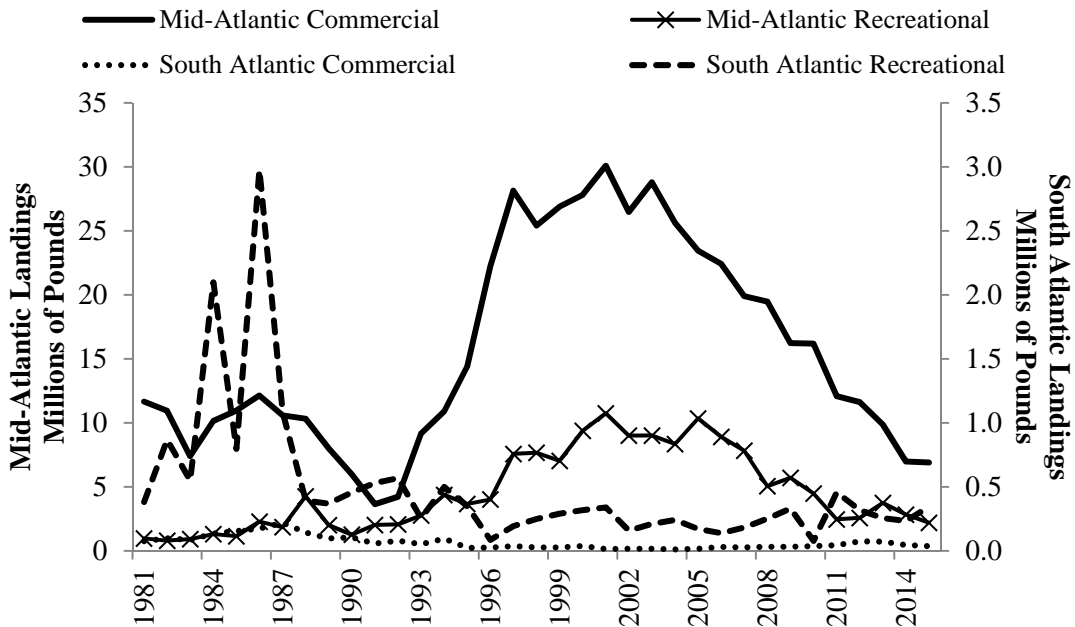


Figure 4. Mid-Atlantic (NJ-NC) and South Atlantic (SC-FL) landings (pounds)
 (See Tables 2 and 3 for values and source information.)

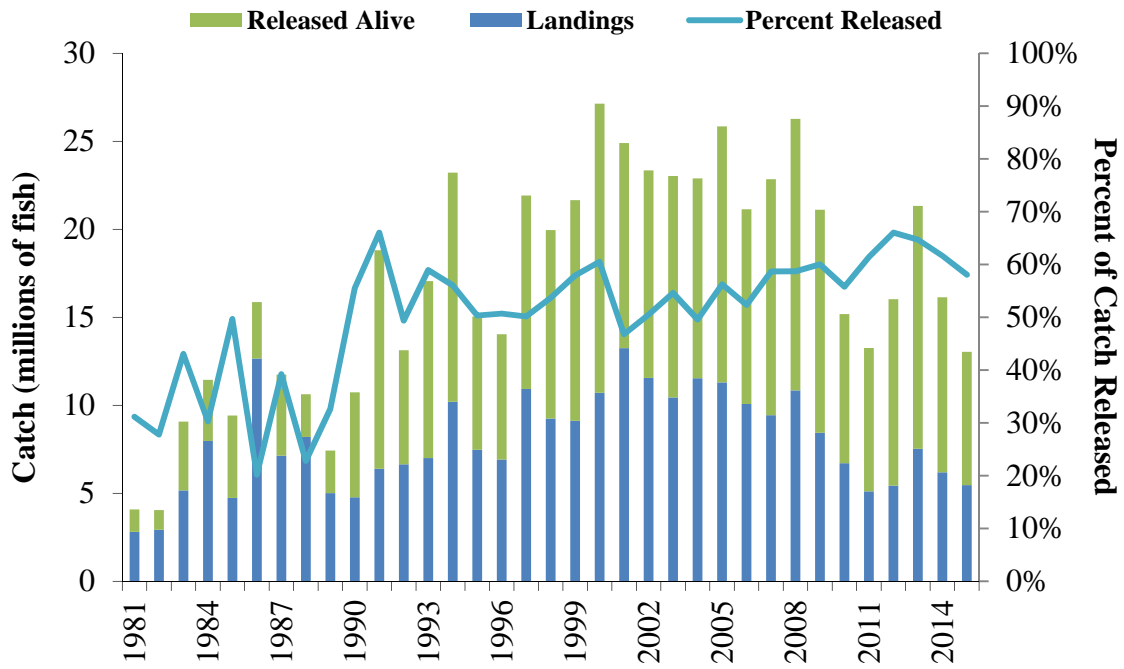


Figure 5. Recreational catch (landings and alive releases, in numbers) and the percent of catch that is released, 1981-2015
 (See Tables 4 and 5 for values and source information.)

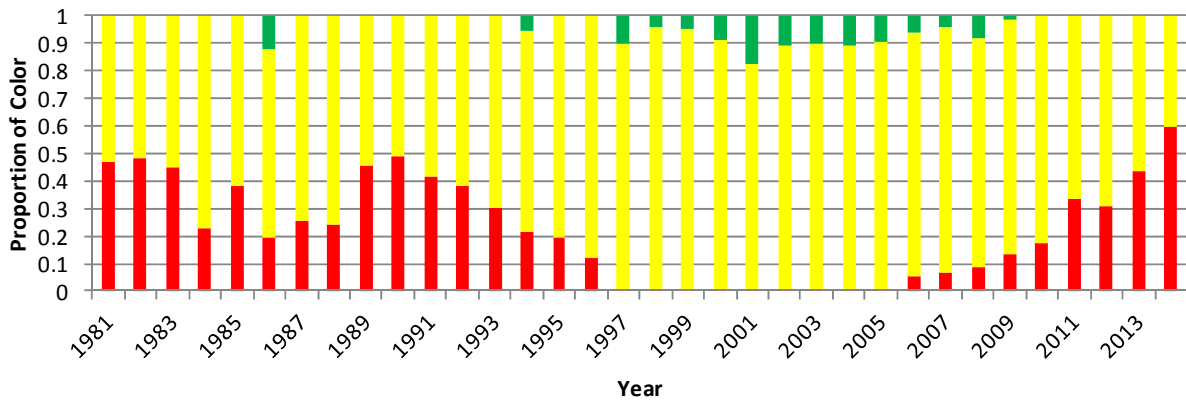


Figure 6. Annual color proportions for the harvest composite TLA of Atlantic croaker recreational and commercial landings.

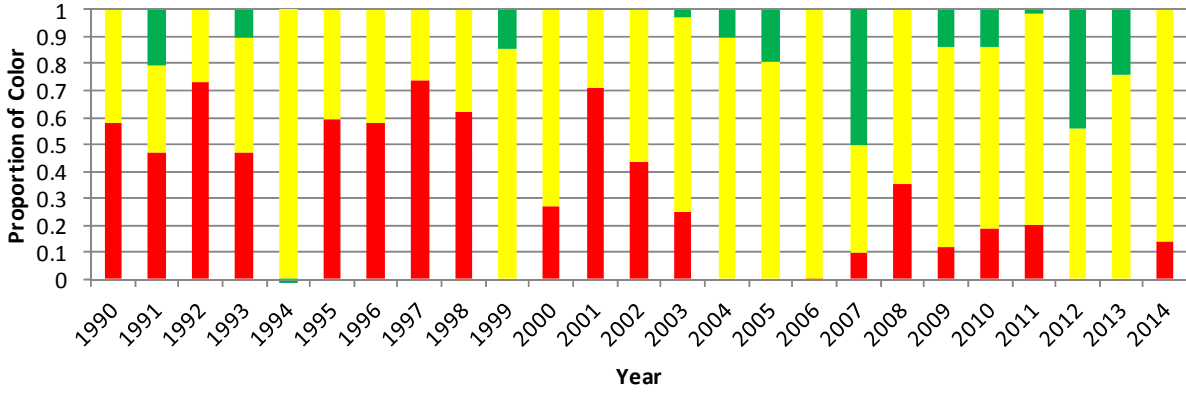


Figure 7. Adult croaker TLA composite characteristic index (NMFS and SEAMAP surveys).

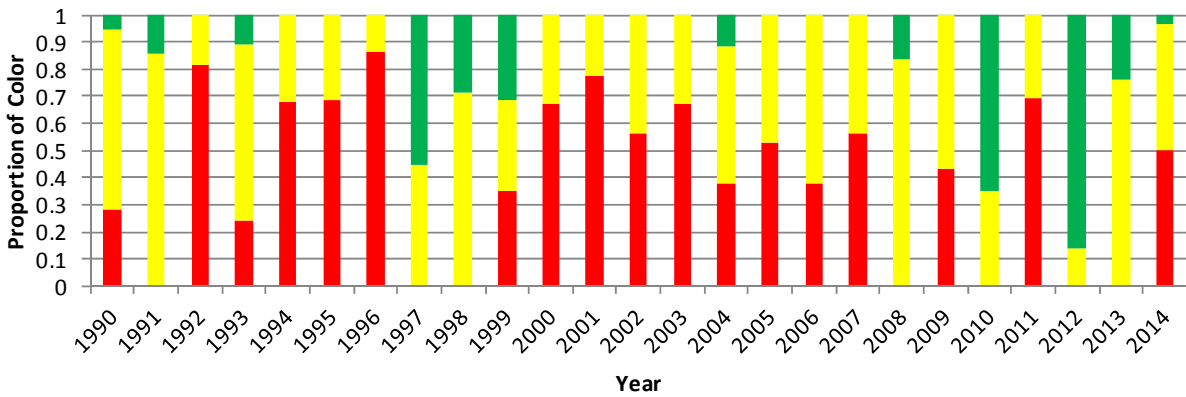


Figure 8. Juvenile croaker TLA composite characteristic index (NC 195 and VIMS surveys).

XI. Tables

Table 1. Summary of state regulations for Atlantic croaker in 2015*

State	Recreational	Commercial
NJ	none	otter/beam trawl mesh restriction for directed croaker harvest (>100 lbs in possession)
DE	8" minimum; recreational gill nets (up to 200 ft.) with license	8" minimum
MD	9" min, 25 fish/day, charter boat logbooks	9" minimum; open 3/16 to 12/31
PRFC	25 fish/day	pound net season: 2/15 to 12/15
VA	none	none
NC	recreational use of commercial gears with license and gear restrictions	
SC	mandatory for-hire logbooks, small Sciaenidae species aggregate bag limit of 50 fish/day	
GA	25 fish/day	25 fish/day limit except for trawlers harvesting shrimp for human consumption (no limit)
FL	none	none

* A commercial fishing license is required to sell croaker in all states with fisheries. For all states, general gear restrictions affect commercial croaker harvest.

Table 2. Commercial harvest (pounds) of Atlantic croaker by state, 1981-2015

(Estimates for 2015 are preliminary. Sources: state compliance reports; personal communication with ACCSP, Arlington, VA.)

Year	NJ	DE	MD	PRFC	VA	NC	SC	GA	FL	Total
1981	23,500	0	2,104	648	429,800	11,205,342	2,441	1,038	72,112	11,736,985
1982	100	0	7,091	188	119,300	10,824,953	386	2,177	95,357	11,049,552
1983	200	0	417	1,549	150,400	7,249,680	3,200	1,097	81,737	7,488,280
1984	57,700	0	27,072	73,701	817,700	9,170,775	3,793	434	131,375	10,282,550
1985	48,800	100	9,510	19,854	2,171,821	8,714,432	1,256		153,803	11,119,576
1986	106,000	500	135,922	99,373	2,367,000	9,424,828	924		173,531	12,308,078
1987	357,600	800	119,409	102,691	2,719,500	7,289,191	698	553	217,932	10,808,374
1988	30,100	200	98,855	12,796	1,749,200	8,434,415	2,614	304	140,033	10,468,517
1989	137,100	0	89,173	5,579	949,649	6,824,088	1,950		95,021	8,102,560
1990	644	42	2,473	5,115	201,353	5,769,512	1,190		104,402	6,084,731
1991	31,292	700	6,183	996	164,126	3,436,960	*		56,739	3,696,996
1992	51,600	800	17,050	17,692	1,339,353	2,796,612			79,040	4,302,147
1993	183,414	2,500	114,159	262,482	5,326,293	3,267,652	*		52,031	9,208,531
1994	117,256	3,000	158,918	240,271	5,759,975	4,615,754	*		96,018	10,991,192
1995	334,654	13,000	489,506	606,184	6,949,639	6,021,284	*		22,879	14,437,146
1996	621,889	9,681	792,326	1,427,285	9,409,904	9,961,834			26,045	22,248,964
1997	1,994,446	10,509	1,088,969	1,518,196	12,832,221	10,711,667	*		36,577	28,192,585
1998	1,029,332	10,368	1,006,529	610,885	11,898,586	10,865,897			26,418	25,448,015
1999	2,071,046	14,729	948,191	1,190,138	12,481,326	10,185,507			26,824	26,917,761
2000	2,130,465	11,121	902,379	1,812,130	12,822,400	10,122,627			37,953	27,839,075
2001	1,389,837	22,736	1,488,815	1,963,294	13,214,731	12,017,424		*	14,831	30,111,668
2002	1,828,484	10,732	894,879	1,421,094	12,133,834	10,189,153	*	*	17,191	26,495,367
2003	1,575,738	16,561	713,205	1,128,003	10,937,167	14,429,197	140	*	16,348	28,816,359
2004	2,067,992	30,369	1,354,982	1,631,596	8,550,574	11,993,003	*	*	11,413	25,639,929
2005	1,847,753	36,624	972,801	481,912	8,211,802	11,903,292	41	*	16,520	23,470,745
2006	1,617,144	19,307	466,833	670,276	9,252,110	10,396,554	160	*	30,272	22,452,656
2007	1,357,731	13,522	477,887	188,567	10,557,370	7,301,296	*		27,028	19,923,401
2008	946,062	10,465	592,211	337,062	11,796,771	5,791,766	116	*	31,560	19,506,013
2009	584,384	16,341	448,550	234,101	8,808,677	6,135,437	215	0	32,313	16,260,018
2010	342,116	6,182	490,067	162,571	7,879,847	7,312,159	3	0	36,960	16,229,905
2011	465,117	12,252	704,019	243,196	5,611,855	5,054,186	44	*	44,932	12,135,601
2012	363,381	2,811	908,619	273,849	6,963,815	3,106,615	62	*	74,023	11,693,175
2013	337,313	6,700	850,336	130,285	6,621,836	1,928,223	2	0	71,448	9,946,143
2014	271,706	9,647	479,079	177,777	3,406,958	2,629,909	247	0	45,319	7,020,642
2015	81,311	3,975	288,331	118,996	4,585,623	1,819,066	69	0	36,720	6,934,091

* confidential data

Table 3. Recreational harvest (pounds) of Atlantic croaker by state, 1981-2015

(Source: personal communication with NMFS Fisheries Statistics Division, Silver Spring, MD.)

Year	NJ	DE	MD	VA	NC	SC	GA	FL	Total
1981	582	2,317		535,297	426,240	67,284	9,665	305,547	1,346,932
1982			70,276	455,250	264,607	67,015	45,161	754,956	1,657,265
1983			32,053	486,006	395,402	14,158	25,412	510,599	1,463,630
1984			86,462	634,870	584,660	161,661	80,684	1,856,599	3,404,936
1985			17,169	843,414	278,214	72,780	40,421	684,449	1,936,447
1986		2,595	116,542	2,034,337	126,888	173,028	21,504	2,783,651	5,258,545
1987			191,628	1,306,814	352,346	64,696	14,947	1,005,053	2,935,484
1988		827	926,399	2,390,573	935,460	54,313	20,313	316,900	4,644,785
1989		284	19,189	1,329,680	658,567	80,580	21,138	268,335	2,377,773
1990		112	37,873	875,427	347,183	123,795	205,352	127,525	1,717,267
1991	4,264	10,972	117,210	1,728,021	157,660	16,173	54,116	460,453	2,548,869
1992		3,291	53,556	1,768,962	233,533	28,512	132,596	407,672	2,628,122
1993	844	9,641	476,866	1,993,915	282,910	18,005	55,604	180,517	3,018,302
1994	818	2,892	991,166	3,024,118	351,230	128,306	34,048	337,474	4,870,052
1995	9,515	82,864	567,149	2,675,381	326,135	25,386	20,862	301,918	4,009,210
1996	39,099	205,526	702,037	2,716,759	346,501	14,480	21,797	50,038	4,096,237
1997	278,758	340,198	1,117,999	5,522,195	309,457	53,863	26,272	113,096	7,761,838
1998	135,733	293,560	1,150,459	5,920,436	161,117	76,821	30,966	141,756	7,910,848
1999	301,957	522,201	1,024,398	4,969,283	212,991	26,356	32,375	231,694	7,321,255
2000	1,125,730	483,963	2,672,996	4,888,910	201,306	13,457	62,390	242,914	9,691,666
2001	1,132,214	304,127	1,278,699	7,674,759	355,009	10,750	7,844	320,487	11,083,889
2002	268,423	250,899	1,162,278	7,075,130	242,184	29,343	10,622	117,880	9,156,759
2003	682,698	262,114	2,069,176	5,674,111	317,606	59,399	71,881	79,397	9,216,382
2004	859,373	307,898	1,078,951	5,792,487	306,029	69,510	15,597	156,395	8,586,240
2005	1,193,848	755,232	987,748	7,240,971	168,797	34,922	14,995	121,320	10,517,833
2006	632,085	729,730	864,415	6,460,336	222,286	16,240	9,210	112,512	9,046,814
2007	453,854	320,458	806,024	6,111,612	131,185	11,109	12,756	159,077	8,006,075
2008	527,179	317,997	462,531	3,612,065	132,731	16,212	12,948	223,121	5,304,784
2009	114,015	239,126	1,512,280	3,708,788	131,742	71,517	36,771	222,239	6,036,478
2010	36,063	40,166	977,562	3,185,485	241,993	11,970	10,067	56,023	4,559,329
2011	21,460	52,889	443,520	1,837,183	99,298	240,665	21,548	194,848	2,911,411
2012	96,366	61,535	397,873	1,905,100	105,530	12,433	13,503	292,365	2,884,705
2013	539,125	100,320	744,642	2,217,664	141,880	32,138	17,209	205,970	3,998,948
2014	205,388	180,787	610,667	1,602,504	227,949	35,785	32,833	165,353	3,061,266
2015	99,768	67,683	360,095	1,479,567	187,590	76,531	37,363	230,968	2,539,565

Table 4. Recreational harvest (numbers) of Atlantic croaker by state, 1981-2015

(Source: personal communication with NMFS Fisheries Statistics Division, Silver Spring, MD.)

Year	NJ	DE	MD	VA	NC	SC	GA	FL	Total
1981	1,054	3,003	0	964,013	1,043,240	165,742	35,591	598,896	2,811,539
1982			10,452	273,039	596,493	193,554	169,749	1,682,619	2,925,906
1983			108,355	2,154,133	1,620,909	60,811	75,173	1,148,227	5,167,608
1984			211,035	2,047,720	2,147,871	588,114	202,364	2,781,742	7,978,846
1985			21,276	2,284,334	723,933	260,265	144,341	1,306,955	4,741,104
1986		4,694	123,578	6,384,966	356,742	599,442	69,887	5,118,552	12,657,861
1987	0	0	208,488	3,234,224	904,030	166,978	44,783	2,580,727	7,139,230
1988		1,186	1,005,452	4,048,690	2,256,128	144,057	64,093	685,778	8,205,384
1989		478	22,871	2,203,504	2,131,763	217,023	72,598	359,417	5,007,654
1990		281	100,673	2,374,679	1,063,452	346,631	585,380	304,064	4,775,160
1991	16,235	37,500	288,471	4,298,542	434,067	100,816	184,435	1,030,115	6,390,181
1992	0	9,854	117,427	4,524,040	723,823	74,051	440,185	754,595	6,643,975
1993	2,552	19,352	805,560	4,990,098	755,998	32,700	89,734	304,067	7,000,061
1994	1,567	5,718	1,633,581	6,494,691	1,179,735	188,520	102,974	599,032	10,205,818
1995	15,184	136,865	827,183	5,029,708	850,606	75,422	100,826	438,076	7,473,870
1996	35,037	235,389	775,115	4,997,021	662,240	37,464	61,957	116,575	6,920,798
1997	342,089	385,586	1,053,232	8,066,926	661,116	118,428	64,050	235,430	10,926,857
1998	143,404	391,231	1,126,058	6,730,181	387,427	170,528	64,953	234,360	9,248,142
1999	357,261	662,724	1,209,572	5,881,671	442,185	54,761	104,438	403,982	9,116,594
2000	1,023,442	517,886	2,674,880	5,486,159	391,056	32,332	128,922	455,870	10,710,547
2001	1,177,813	312,005	1,319,928	9,335,313	635,552	19,802	21,503	426,264	13,248,180
2002	253,472	261,634	1,223,385	9,129,060	408,944	66,409	36,497	177,751	11,557,152
2003	692,391	341,174	1,619,766	6,695,192	490,399	198,339	248,853	165,459	10,451,573
2004	855,927	389,218	896,855	8,259,608	511,418	171,544	38,599	415,570	11,538,739
2005	1,227,349	825,267	784,246	7,657,147	326,777	143,387	39,561	302,784	11,306,518
2006	511,220	763,216	754,969	7,221,148	556,024	58,500	34,081	172,586	10,071,744
2007	406,238	359,064	872,838	6,944,886	461,162	38,147	45,068	310,130	9,437,533
2008	600,975	368,911	619,942	8,388,497	317,940	65,853	38,246	449,054	10,849,418
2009	193,464	451,849	1,335,439	5,327,388	368,990	238,900	82,269	438,209	8,436,508
2010	63,027	75,404	1,136,589	4,743,697	478,156	46,464	35,635	132,664	6,711,636
2011	40,855	92,289	554,206	3,305,707	246,676	349,463	44,044	476,292	5,109,532
2012	266,832	84,403	701,482	3,445,232	288,813	27,873	38,402	589,642	5,442,679
2013	889,754	222,401	1,155,538	4,273,744	411,882	106,938	54,915	411,858	7,527,030
2014	263,734	359,010	1,085,339	3,429,768	541,657	149,890	64,138	298,322	6,191,858
2015	116,109	127,712	650,335	3,342,008	463,867	216,168	111,344	440,363	5,467,906

Table 5. Recreational releases (number) of Atlantic croaker by state, 1981-2015

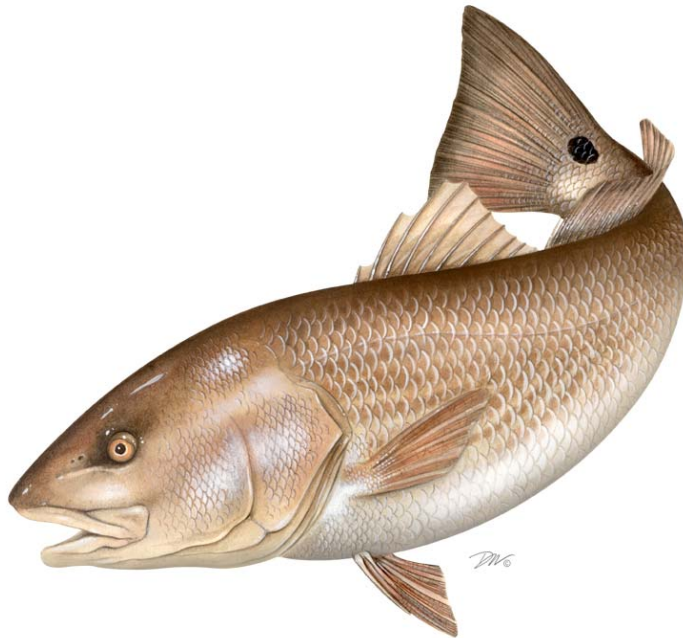
(Source: personal communication with NMFS Fisheries Statistics Division, Silver Spring, MD.)

Year	NJ	DE	MD	VA	NC	SC	GA	FL	Total
1981			16,233	324,238	704,259	128,192	13,481	85,740	1,272,143
1982				77,756	641,327	107,340	111,630	188,277	1,126,330
1983			1,507,184	1,410,151	424,562	119,036	70,499	379,021	3,910,453
1984			70,192	673,080	1,701,418	746,905	37,573	236,432	3,465,600
1985			13,132	1,616,052	1,596,901	238,678	66,649	1,146,582	4,677,994
1986		1,757	43,399	2,578,268	137,841	84,335	40,623	318,511	3,204,734
1987	1,374	861	32,074	2,056,580	560,853	108,366	76,908	1,770,697	4,607,713
1988		582	273,231	832,284	984,219	112,271	20,021	200,630	2,423,238
1989		1,307	41,822	1,342,169	891,926	58,642	17,632	72,822	2,426,320
1990		1,268	88,688	3,922,564	1,351,152	111,085	317,497	168,144	5,960,398
1991	91,633	75,319	3,352,190	7,418,045	669,385	25,168	140,402	647,824	12,419,966
1992	4,103	43,583	856,292	4,167,137	954,494	26,729	178,267	251,343	6,481,948
1993	5,799	13,194	2,504,362	5,795,479	1,499,217	16,949	83,203	138,875	10,057,078
1994	17,253	14,069	1,628,824	7,676,780	3,110,528	141,513	99,026	331,736	13,019,729
1995	31,019	41,574	496,046	5,494,289	1,172,716	108,345	89,609	141,732	7,575,330
1996	17,585	76,851	403,776	5,151,206	1,218,799	64,494	60,282	126,300	7,119,293
1997	111,468	384,233	1,497,670	7,275,160	1,443,568	138,107	25,630	116,276	10,992,112
1998	221,324	839,932	3,021,780	4,990,541	1,060,928	266,068	159,928	152,744	10,713,245
1999	860,325	1,017,499	2,483,800	5,668,925	1,368,478	116,826	57,567	967,894	12,541,314
2000	688,746	694,813	4,967,856	7,811,048	1,569,385	96,402	169,903	428,131	16,426,284
2001	853,621	285,123	1,585,806	7,086,706	1,256,807	115,284	192,362	282,461	11,658,170
2002	369,003	361,355	2,523,276	7,107,656	925,806	92,498	194,474	217,054	11,791,122
2003	833,508	654,697	1,393,224	6,543,524	1,552,315	440,446	965,496	192,356	12,575,566
2004	1,237,164	599,207	854,132	6,276,767	1,656,049	320,788	154,259	253,951	11,352,317
2005	1,692,401	674,684	1,136,876	8,738,109	1,401,413	321,861	280,889	293,692	14,539,925
2006	503,490	937,193	1,783,557	4,193,675	2,578,819	595,075	283,851	187,562	11,063,222
2007	590,078	672,771	1,258,131	8,504,212	1,608,120	224,454	228,564	321,559	13,407,889
2008	2,373,945	601,994	2,127,219	7,806,627	1,419,019	205,373	293,926	596,450	15,424,553
2009	108,370	537,587	1,137,578	7,621,484	1,912,670	514,839	434,608	406,822	12,673,958
2010	167,191	228,936	1,011,236	4,824,151	1,598,139	187,184	263,987	188,637	8,469,461
2011	62,391	88,524	365,716	4,872,928	1,798,230	240,605	262,493	452,669	8,143,556
2012	1,134,778	444,935	1,578,524	5,091,063	1,255,216	271,321	167,488	641,570	10,584,895
2013	765,652	764,045	2,905,537	5,968,340	1,984,701	799,982	298,409	318,319	13,804,985
2014	206,098	630,964	1,148,867	3,606,078	2,713,787	780,171	470,751	393,360	9,950,076
2015	78,135	111,422	499,647	2,760,541	2,532,950	959,887	210,454	418,286	7,571,322

**2016 REVIEW OF THE
ATLANTIC STATES MARINE FISHERIES COMMISSION
FISHERY MANAGEMENT PLAN FOR**

**RED DRUM
(*Sciaenops ocellatus*)**

2015 FISHING YEAR



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I. Status of the Fishery Management Plan

<u>Date of FMP Approval:</u>	Original FMP – October 1984
<u>Amendments:</u>	Amendment 1 – October 1991 Amendment 2 – June 2002 Addendum 1 – August 2013
<u>Management Areas:</u>	The Atlantic coast distribution of the resource from New Jersey through Florida Northern: New Jersey through North Carolina Southern: South Carolina through the east coast of Florida
<u>Active Boards/Committees:</u>	South Atlantic State/Federal Fisheries Management Board; Red Drum Technical Committee, Stock Assessment Subcommittee, Plan Development Team, Plan Review Team, South Atlantic Species Advisory Panel

The Atlantic States Marine Fisheries Commission (ASMFC) adopted an interstate Fishery Management Plan (FMP) for Red Drum in 1984. The original management unit included the states from Maryland to Florida. In 1988, the Interstate Fisheries Management Program (ISFMP) Policy Board requested that all Atlantic coastal states from Maine to Florida implement the plan's recommended management regulations to prevent development of northern markets for southern fish. The states of New Jersey through Florida are now required to follow the FMP, while Maine through New York (including Pennsylvania) are encouraged to implement consistent provisions to protect the red drum spawning stock.

In 1990, the South Atlantic Fishery Management Council (Council) adopted a FMP for red drum that defined overfishing and optimum yield (OY) consistent with the Magnuson Fishery Conservation and Management Act of 1976. Adoption of this plan prohibited the harvest of red drum in the exclusive economic zone (EEZ), a moratorium that remains in effect today. Recognizing that all harvest would take place in state waters, the Council FMP recommended that states implement measures necessary to achieve the target level of at least 30% escapement.

Consequently, ASMFC initiated Amendment 1 in 1991, which included the goal to attain optimum yield from the fishery over time. Optimum yield was defined as the amount of harvest that could be taken while maintaining the level of spawning stock biomass per recruit (SSBR) at or above 30% of the level which would result if fishing mortality was zero. However, a lack of information on adult stock status resulted in the use of a 30% escapement rate of sub-adult red drum to the off-shore adult spawning stock.

Substantial reductions in fishing mortality were necessary to achieve the escapement rate; however, the lack of data on the status of adult red drum along the Atlantic coast led to the adoption of a phase-in approach with a 10% SSBR goal. In 1991, states implemented or maintained harvest controls necessary to attain the goal.

As hoped, these management measures led to increased escapement rates of juvenile red drum. Escapement estimates for the northern region of New Jersey through North Carolina (18%) and

the southern region of South Carolina through Florida (17%) were estimated to be above the 10% phase-in goal, yet still below the ultimate goal of 30% (Vaughan and Carmichael 2000). North Carolina, South Carolina, and Georgia implemented substantive changes to their regulations from 1998-2001 that further restricted harvest.

The Council adopted new definitions of OY and overfishing for red drum in 1998. Optimum yield was redefined as the harvest associated with a 40% static spawning potential ratio (sSPR), overfishing as an sSPR less than 30%, and an overfishing threshold as 10% sSPR. In 1999, the Council recommended that management authority for red drum be transferred to the states through the Commission's Interstate Fishery Management Program (ISFMP) process. This was recommended, in part, due to the inability to accurately determine an overfished status, and therefore stock rebuilding targets and schedules, as required under the revised Sustainable Fisheries Act of 1996. The transfer necessitated the development of an amendment to the interstate FMP in order to include the provisions of the Atlantic Coastal Fisheries Cooperative Management Act.

ASMFC adopted Amendment 2 to the Red Drum FMP in June 2002 (ASMFC 2002), which serves as the current management plan. The goal of Amendment 2 is to achieve and maintain the OY for the Atlantic coast red drum fishery as the amount of harvest that can be taken by U.S. fishermen while maintaining the sSPR at or above 40%. There are four plan objectives:

- Achieve and maintain an escapement rate sufficient to prevent recruitment failure and achieve an sSPR at or above 40%.
- Provide a flexible management system to address incompatibility and inconsistency among state and federal regulations which minimizes regulatory delay while retaining substantial ASMFC, Council, and public input into management decisions; and which can adapt to changes in resource abundance, new scientific information, and changes in fishing patterns among user groups or by area.
- Promote cooperative collection of biological, economic, and sociological data required to effectively monitor and assess the status of the red drum resource and evaluate management efforts.
- Restore the age and size structure of the Atlantic coast red drum population.

The management area extends from New Jersey through the east coast of Florida, and is separated into a northern and southern region at the North Carolina/South Carolina border. The sSPR of 40% is considered a target; an sSPR below 30% (threshold level) results in an overfishing determination for red drum. Amendment 2 required all states within the management unit to implement appropriate recreational bag and size limit combinations needed to attain the target sSPR, and to maintain current, or implement more restrictive, commercial fishery regulations. All states were in compliance by January 1, 2003. See Table 1 for state commercial and recreational regulations in 2015.

Following the approval of Amendment 2 in 2002, the process to transfer management authority to ASMFC began, including an Environmental Assessment and public comment period. The final rule became effective November 5, 2008. It repeals the federal Atlantic Coast Red Drum Fishery Management Plan and transfers management authority of Atlantic red drum in the exclusive

economic zone from the South Atlantic Fishery Management Council to the Atlantic States Marine Fisheries Commission.

The Board approved Addendum I to Amendment 2 in August 2013. The Addendum revised the habitat section of Amendment 2 to include current information on red drum spawning habitat and life-stages (egg, larval, juvenile, sub-adult, and adult). It also identified and described the distribution of key habitats and habitats of concern.

II. Status of the Stocks

The red drum stock is currently being evaluated in accordance with the 2009 Benchmark Stock Assessment. At present, only an overfishing status can be determined for red drum (SAFMC 2009).

Northern Region (NJ-NC)

Recruitment (age 1 abundance) has varied since 1989 (Figure 1). Abundance of age 1 – 3 red drum increased during 1990 – 2000 and has fluctuated thereafter (Figure 2). The initial increase in abundance of these age groups can be explained by the reduction in exploitation rates early in the time series, followed by relative stability (Figure 3).

The trend in the three-year average sSPR indicates low sSPR early in the time series with increases during 1990 – 1997 and fluctuations thereafter (Figure 4). The average sSPR has been above the overfishing threshold ($F_{30\%}$) since 1994, and at or above the target ($F_{40\%}$) since 1996, except during one year (2002). Fishing pressure and mortality appear to be stabilized near the target fishing mortality. The average sSPR is also likely above the target benchmark.

Southern Region (SC-FL)

Recruitment (age 1 abundance) has fluctuated without apparent trend since 1989 (Figure 1). Abundance of age 1 – 3 red drum increased during 1989 – 1992, declined during 1992 – 1998, and has fluctuated thereafter (Figure 2). As with the northern stock, the initial increase in abundance of these age groups can be explained by the reduction in exploitation rates early in the time series. Exploitation rates appear to have slightly increased since 1990 (Figure 3).

A high level of uncertainty exists around the sSPR estimates for the southern region. More work is needed to make definitive statements about sSPR, but it is likely that the average sSPR in 2007 was above the overfishing threshold ($F_{30\%}$), although not above the target as was probable in the northern region. The stock is therefore likely not subject to overfishing at this time. Due to the uncertainties, it is not possible to determine status in relation to the target of 40% sSPR.

Ongoing 2016 Benchmark Assessment

The Technical Committee (TC) and Stock Assessment Subcommittee (SASC) is currently working on a new Benchmark Stock Assessment. Given the high level of uncertainty around the sSPR estimates in the 2009 assessment, a primary goal of the current assessment has been to accurately estimate abundance and biomass in order to determine whether or not the stock is overfished and/or overfishing is occurring. In order to achieve this, the SASC decided to switch modeling frameworks and develop a Stock Synthesis model (SS3).

During the transition to SS3, the SASC encountered several challenges in developing SS3 models that estimate plausible stock conditions and dynamics. A specific concern was the lack of stability in both the northern and southern models. These issues persisted through the SEDAR 44 workshop and, as a result, the peer review took on a collaborative approach where panelists reviewed the assessment work to date and provided constructive comments on modifications to the models. The SASC continued work on the stock assessment following the Review Workshop and was able to make significant improvements. Updated work by the SASC was desk reviewed in April 2016. The Peer Review Panel recommended the stock assessment for management and presented to the Board in May 2016. During their review of the assessment, the Board requested additional analysis to ensure the results of the new model are accurate. These analyses include an evaluation of tag return rates in the fishery and continuity models, both of which will be presented to the Board in October 2016.

III. Status of the Fishery

Total red drum landings from New Jersey through the east coast of Florida in 2015 are estimated at 1.62 million pounds (Tables 2 and 3, Figure 5). This is roughly 834,000 pounds less than was landed in 2014 and 1.482 million pounds less than in 2013. 2015 total landings also fall below the previous ten-year (2006-2015) average of 1.89 million pounds. The commercial and recreational fisheries harvested 9% and 91% of the total, respectively. The southern region includes South Carolina through Florida's east coast, while the northern region includes New Jersey through North Carolina. In 2015, 68% of the total landings came from the southern region where the fishery is exclusively recreational, and 32% from the northern region (Figure 6).

Coastwide commercial landings show no particular temporal trends. In the last 50 years, landings have ranged from approximately 55,000 pounds (in 2004) to 440,000 pounds (in 1950, Figure 5). In 2015, red drum were commercially landed only in Maryland, Virginia, and North Carolina (Table 2). Coastwide commercial harvest slightly increased from 102,949 pounds in 2014 to 141,836 pounds in 2015, with 99% harvested by North Carolina. Historically, North Carolina and Florida shared the majority of commercial harvest, but commercial harvest has been prohibited in Florida under state regulation since January 1988. South Carolina also banned commercial harvest and sale of native caught red drum beginning in 1987, and in 2013 Georgia designated Red Drum Gamefish status, eliminating commercial harvest and sale.

In North Carolina, a daily commercial trip limit and an annual cap of 250,000 pounds with payback of any overage constrain the commercial harvest. Unique to this state, the red drum fishing year extends from September 1 to August 31. In 2008, the Board approved use of the fishing year to monitor the cap. During the 2009/2010 and the 2013/2014 fishing years, North Carolina had overages of 25,858 pounds and 12,753 pounds, respectively. The commercial harvest for each following fishing year remained well below the adjusted cap allowance, providing sufficient payback.

Recreational harvest of red drum peaked in 1984 at 1.05 million fish (or 2.6 million pounds; Tables 3 and 4). Since 1988, the number has fluctuated without trend between 250,000 and 760,000 fish (800,000 to 2.6 million pounds; Figures 5 and 7). Recreational harvest decreased from 641,658 fish (2.3 million pounds) in 2014 to 426,304 fish (1.5 million pounds) in 2015. The 2015 harvest is lower than the 10 year average (2006-2015) for recreational harvest in numbers (504,346) and

pounds (1.7 million). Florida anglers landed the largest share of the coastwide recreational harvest in numbers (53%), followed by South Carolina (25%), Georgia (11%), and North Carolina (9%).

Anglers release far more red drum than they keep; the percent of the catch released has been over 80% during the last decade (Figure 7). Recreational releases show an increasing trend over the time series. The proportion of releases in 2015 was 84% (versus 83% in 2014), and the overall number of fish released was 2.2 million in 2015 (Figure 3, Table 5). It is estimated that 8% of released fish die as a result of being caught, resulting in an estimated 175,608 dead discarded fish in 2015 (Table 5). Recreational removals from the fishery are thus estimated to be 601,912 fish in 2015 (Figure 8).

IV. Status of Assessment Advice

Current stock status information comes from the 2009 benchmark stock assessment (SAFMC 2009) completed by the ASMFC Red Drum Stock Assessment Subcommittee and Technical Committee; peer reviewed by an independent panel of experts at the Southeast Data, Assessment, and Review (SEDAR) 18; and approved by the South Atlantic State-Federal Fisheries Management Board for use in management decisions. Previous interstate management decisions were based on regional assessments conducted by Vaughan and Helser (1990), Vaughan (1992, 1993, 1996), and Vaughan and Carmichael (2000). Several states have also conducted state-specific assessments (e.g., Murphy and Munyandorero 2009; Takade and Paramore 2007).

The 2009 stock assessment uses a statistical catch at age (SCA) model with age-specific data for red drum ages 1 through 7+. This is a change from virtual population analyses used in past assessments, primarily due to their inherent assumption that the catch at age is known without error, whereas there is limited data to describe the catch of red drum early in the time series. Data from 1989-2007 were included from the following sources: commercial and recreational harvest and discard data, fishery-dependent and -independent biological sampling data, tagging data, and fishery-independent survey abundance data.

The SEDAR 18 Review Panel considered the use of an SCA model appropriate given the types of data available for red drum. With certain revisions made to the data and the model configurations before or at the Review Workshop, the SEDAR 18 Review Panel supported the use of the final model runs. For the northern region, the Review Panel agreed that the model was informative of age 1 – 3 abundance and exploitation rates, but not for older age groups. The model was also found to be informative of annual trends in sSPR and the 2005 – 2007 average sSPR. For the southern region, the Review Panel agreed that the model was informative of relative (not absolute) trends in age 1 – 3 abundance and exploitation, but not for older age groups. The model was also considered to be informative of relative trends in annual sSPR and the three-year average sSPR, this result being highly conditional on the estimated fishery selectivity pattern. These results for the southern region allow for only general statements on stock status.

The Review Panel accepted the existing threshold and target overfishing benchmarks of 30% sSPR and 40% sSPR for red drum. However, the Review Panel did not consider annual changes in sSPR to be informative and recommended adopting a three-year running mean of estimated annual sSPR as the indicator to compare to the management benchmarks. Because of the high uncertainty in the

age 4 –7+ dynamics, the Review Panel did not see value in attempting to estimate indicators and benchmarks of stock biomass which would be used to measure overfished status.

A new benchmark assessment for red drum was presented to the Board in May 2016. To ensure accuracy of the new model, the Board requested additional analyses. These will be presented to the Board in October 2016.

V. Status of Research and Monitoring

No monitoring or research programs are annually required of the states except for the submission of a compliance report. The following fishery-dependent (other than catch and effort data) and fishery-independent monitoring programs were reported in the 2016 reports.

Fishery Dependent Monitoring

- Delaware DFW -- Commercial monitoring through mandatory logbook reports.
- Maryland DNR – Commercial pound nets sampled bi-weekly in the Chesapeake Bay from late spring through summer (2015 n=0). Licensed charter boat captain logbooks are monitored for red drum captures (2015: 16 caught, 2 harvested).
- PRFC -- Red drum are harvested incidentally in the commercial pound net and haul seine fisheries. The mandatory commercial harvest daily reporting system, which collects harvest and discards/releases, reported zero red drum released in 2015.
- Virginia MRC –Volunteer anglers have participated since 1995 in the Virginia Game Fish Tagging Program (2015: 283 fish tagged, 23 reported recaptures). Carcasses collected through the Marine Sportfish Collection Project since 2007 (2015 n=0).
- North Carolina DMF – Commercial cap monitored through trip ticket program; commercially-landed red drum sampled through biological monitoring program since 1982 (2015: 429 fish measured, primarily gill net). North Carolina Red Drum Tagging Program (2015: 2,115 fish tagged, 115 reported recaptures).
- South Carolina DNR –State finfish survey conducted in January and February (2015 n=129, mean catch rate: 2.9 red drum/targeted angler hour). Charter Vessel Trip Reporting (2015 release rate: 93.2%). SC Marine Game Fish Tagging Program studies movement patterns, growth rates, and release-mortality rates (in 2015, 2,089 fish tagged, 445 recaptured). Tournament and freezer fish programs (2015 n=20).
- Georgia CRD – Age, length, and sex data collected through the Marine Sportfish Carcass Recovery Project (2015: 352 red drum).
- Florida FWC –10,807 trip interviews in 2015 collected data on total-catch rates and sizes (through MRIP).
- NMFS – Length measurements and recreational catch, harvest, release, and effort data are collected via the Marine Recreational Information Program.

Fishery Independent Monitoring

- New Jersey DFW – Five annual nearshore trawl surveys conducted since 1988, in January/February, April, June, August, and October. Length and weight data, and catch per unit effort (CPUE) in number of fish per tow and biomass per tow recorded for all species. Only two red drum were caught in entire time series (single tow, 2013).
- North Carolina DMF - Seine survey since 1991 produces age-0 abundance index (2015 n=586; CPUE of 4.9, increase from 2014 CPUE of 2.3). Gill net survey in Pamlico Sound

since 2001 characterizes size and age distribution, produces abundance index, improves bycatch estimates, and studies habitat usage (2015 CPUE of 2.10, slightly below average). Longline survey since 2007 produces adult index of abundance and tags fish (2015 n=321; CPUE remained stable and near average at 4.5 fish per set).

- South Carolina DNR – Estuarine trammel net survey for subadults (2015 CPUE lowest on record). Electrofishing survey in low salinity estuarine areas for juveniles/subadults (2015 CPUE third lowest on record). Inshore bottom longline survey for biological data and adult abundance index (673 tagged, 119 sampled for age in 2015). Genetic subsampling and tagging conducted during these three surveys.
- Georgia CRD – Estuarine trammel net survey for subadult biological data and abundance index (2015 n = 52). Estuarine gill net survey for young-of-year (YOY) biological data and abundance index (2015 n = 296). Bottom longline survey for adult biological data and abundance index (2015 n = 37).
- Florida FWC-FWRI – Two seine surveys in northern Indian River Lagoon (IRL) and lower St. Johns River (SJR) for YOY (< 40 mm SL) abundance indices (2015 CPUE returned to low 2011-2012 levels after 2013 spike). Haul seine survey in these areas and southern IRL for subadult index (2015 CPUE was lowest on record). Age and length data collected during surveys.

VI. Status of Management Measures and Issues

Fishery Management Plan

Amendment 2 was fully implemented by January 1, 2003, providing the management requirements for 2010. Requirements include: recreational regulations designed to achieve at least 40% sSPR, a maximum size limit of 27 inches or less, and current or more stringent commercial regulations. States are also required to have in place law enforcement capabilities adequate to successfully implement their red drum regulations. In August 2013, the Board approved Addendum I to Amendment 2 of the Red Drum FMP. The Addendum revises the habitat section of Amendment 2 to include the most current information on red drum spawning habitat for each life stage (egg, larval, juvenile, sub-adult, and adult). It also identifies the distribution of key habitats and habitats of concern, including potential threats and bottlenecks.

De Minimis Requests

New Jersey and Delaware requested *de minimis* status through the annual reporting process. While Amendment 2 does not include a specific method to determine whether a state qualifies for *de minimis*, the PRT chose to evaluate an individual state's contribution to the fishery by comparing the two-year average of total landings of the state to that of the management unit. New Jersey and Delaware each harvested zero percent of the two-year average total landings. *De minimis* status does not exempt either state from any requirement; it may exempt them from future management measures implemented through addenda to Amendment 2, as determined by the Board.

Changes to State Regulations

A 12,753 pound overage occurred in North Carolina in the 2013/2014 fishing year, resulting in a cap adjustment to 237,247 pounds. Commercial harvest in the 2014/2015 fishing year remained well below the adjusted cap allowance, providing sufficient payback.

VII. Implementation of FMP Compliance Requirements for 2015

The PRT finds that all states have implemented the requirements of Amendment 2.

VIII. Recommendations of the Plan Review Team

Management and Regulatory Recommendations

- < Consider approval of the *de minimis* requests by New Jersey and Delaware
- < Support a continued moratorium of red drum fishing in the exclusive economic zone.

Prioritized Research and Monitoring Recommendations (H) =High, (M) =Medium, (L) =Low

Stock Assessment and Population Dynamics

- < Improve catch/effort estimates and biological sampling from recreational and commercial fisheries for red drum, including increased effort to intercept night fisheries for red drum. (H)
- < Allocate efforts to determine the size and age structure of regulatory discards of live red drum. (H)
- < Expand biological sampling based on a statistical analysis to adequately characterize the age/size composition of removals by all statistical strata (gears, states, etc.) (H)
- < Each state should develop an on-going red drum tagging program that can be used to estimate both fishing and natural mortality and movements. This should include concurrent evaluations of tag retention, tagging mortality, and angler tag reporting rates. The importance of each state's tagging data to the assessment should be evaluated. (H)
- < Establish programs to provide on-going estimates of commercial discards and recreational live release mortality using appropriate statistical methods. Discard estimates should examine the impact of slot-size limit management and explore regulatory discard impacts due to high-grading. (M)
- < Evaluate the broader survey needs to identify gaps in current activities and provide for potential expansion and/or standardization between/among current surveys (M).

Biological

- < Explore methods to effectively sample the adult population in estuarine, nearshore, and open ocean waters, such as in the ongoing red drum long line survey. (H)
- < Determine if natural environmental perturbations limit recruitment, and if spawning stock size is the cause of recruitment variability (H)
- < Continue tagging studies to determine stock identity, inshore/offshore migration patterns of all life stages (i.e. basic life history info gathering). Specific effort should be given to developing a large-scale program for tagging adult red drum (M)
- < Fully evaluate the effects and effectiveness of using cultured red drum to facilitate higher catch rates along the Atlantic coast. (M)
- < Determine habitat preferences, environmental conditions, growth rates, and food habits of larval and juvenile red drum throughout the species range along the Atlantic coast. Assess the effects of environmental factors on stock density/yearclass strength. (M)
- < Refine maturity schedules on a geographic basis. Thoroughly examine the influence of size and age on reproductive function. Investigate the possibility of senescence in female red drum. Archive histological specimens across sizes to look for shifts in maturity schedules and make regional comparisons. (M)

Social

- < Examine the effectiveness of controlling fishing mortality and minimum size in managing red drum fisheries.
- < Encourage the NMFS to fund socioeconomic add-on questions to the recreational fisheries survey that are specifically oriented to red drum recreational fishing.

Economic

- < Encourage the NMFS to continue funding socioeconomic add-on questions to the recreational fisheries survey that include data elements germane to red drum recreational fisheries management.
- < Where appropriate, encourage member states to conduct studies to evaluate the economic costs and benefits associated with current and future regulatory regimes impacting recreational anglers including anglers oriented toward catch and release fishing trips.
- < Fully evaluate the efficacy of using cultured red drum to restore native stocks along the Atlantic Coast including risk adjusted cost-benefit analyses.
- < Conduct a special survey and related data analysis to determine the economic and operational characteristics of the "for-hire sector" targeting red drum especially fishing guide oriented businesses in the South Atlantic states.
- < Estimate the economic impacts (e.g. sales, jobs, income, etc.) of recreational red drum fisheries at the state and regional level including the "for-hire sector" (e.g. fishing guides).
- < States with significant fisheries (over 5,000 pounds) should collect socioeconomic data on red drum fisheries through add-ons to the recreational fisheries survey or by other means.

Habitat

- < Identify spawning areas of red drum in each state from North Carolina to Florida so these areas may be protected from degradation and/or destruction. (H)
- < Identify changes in freshwater inflow on red drum nursery habitats. Quantify the relationship between freshwater inflows and red drum nursery/sub-adult habitats. (H)
- < Determine the impacts of dredging and beach re-nourishment on red drum spawning and early life history stages. (M)
- < Investigate the concept of estuarine reserves to increase the escapement rate of red drum along the Atlantic coast. (M)
- < Identify the effects of water quality degradation (changes in salinity, DO, turbidity, etc.) on the survival of red drum eggs, larvae, post-larvae, and juveniles. (M)
- < Quantify relationships between red drum production and habitat. (L)
- < Determine methods for restoring red drum habitat and/or improving existing environmental conditions that adversely affect red drum production. (L)

IX. References

- Atlantic States Marine Fisheries Commission (ASMFC). 2002. Amendment 2 to the Interstate Fishery Management Plan for Red Drum. ASMFC, Washington, DC, Fishery Management Report No. 38, 141 p.
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- Vaughan, DS and TE Helsler. 1990. Status of the red drum stock of the Atlantic coast: Stock assessment report for 1989. NOAA Tech. Mem. NMFS-SEFC-263. 117 p.

X. Figures

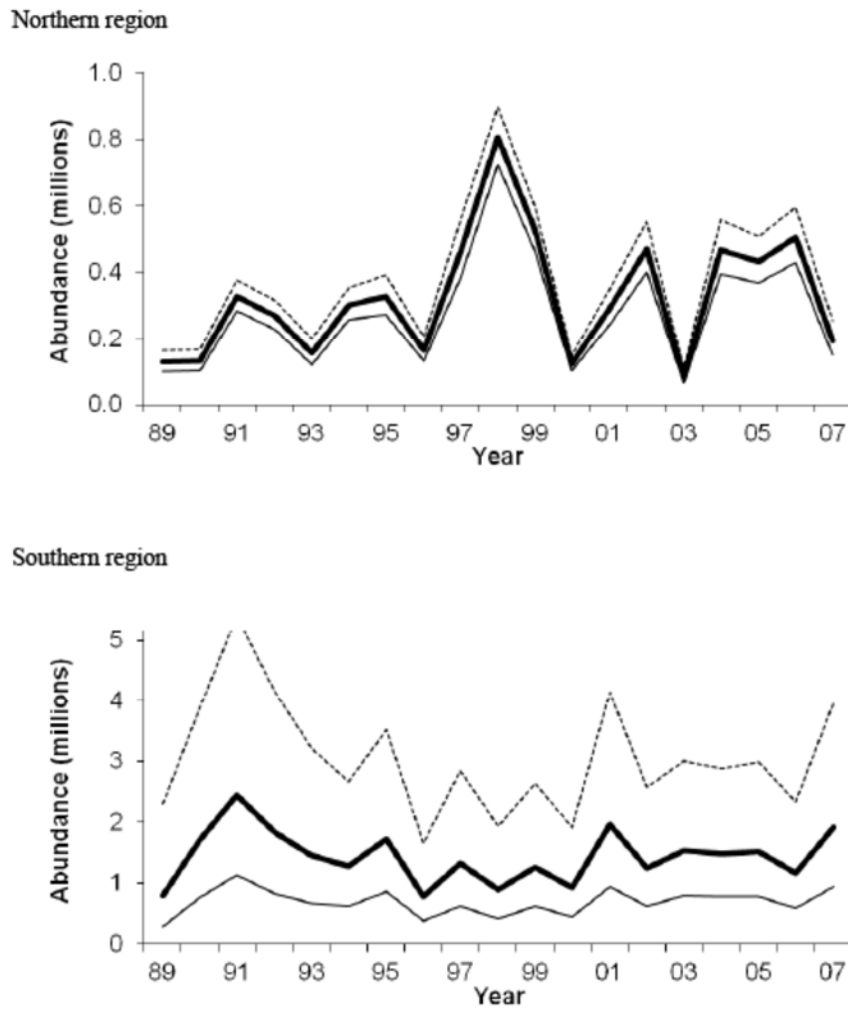
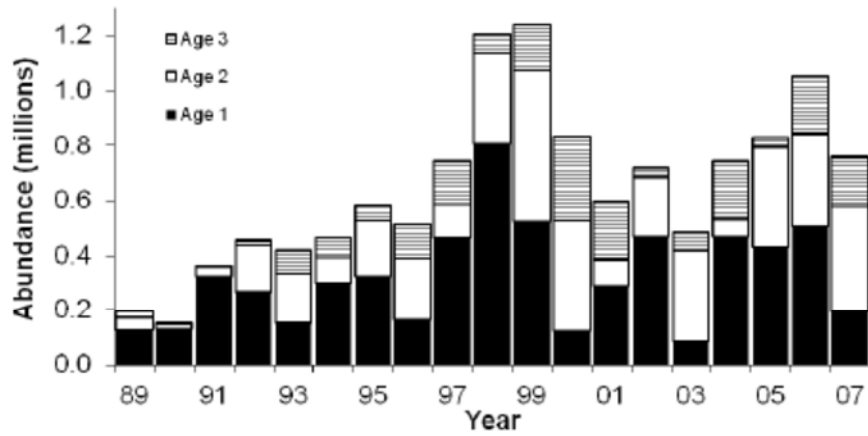


Figure 1. Estimated recruitment (age-1 abundance, heavy solid line) and ± 1.96 standard errors for the northern and southern regions during 1989-2007 (Source: SAFMC 2009). Note: assessment results for the southern region are indicative of relative trends but not absolute values.

Northern region



Southern region

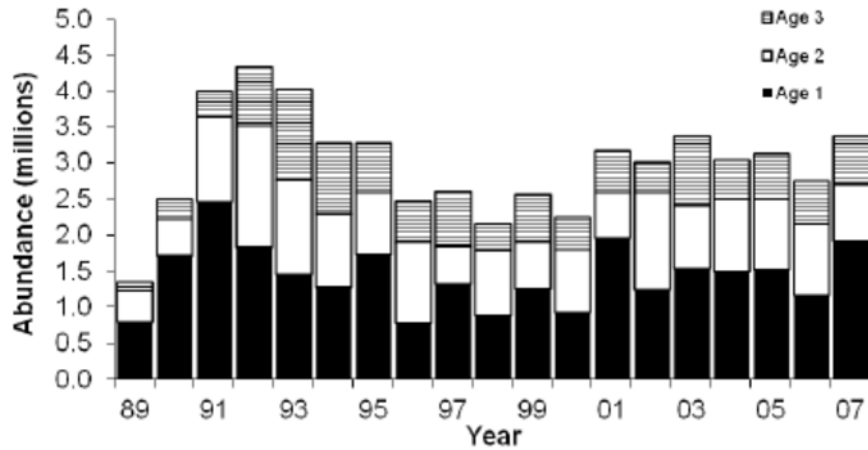


Figure 2. Estimates of abundance of red drum ages 1-3 in the northern and southern regions during 1989-2007 (Source: SAFMC 2009). Note: assessment results for the southern region are indicative of relative trends but not absolute values.

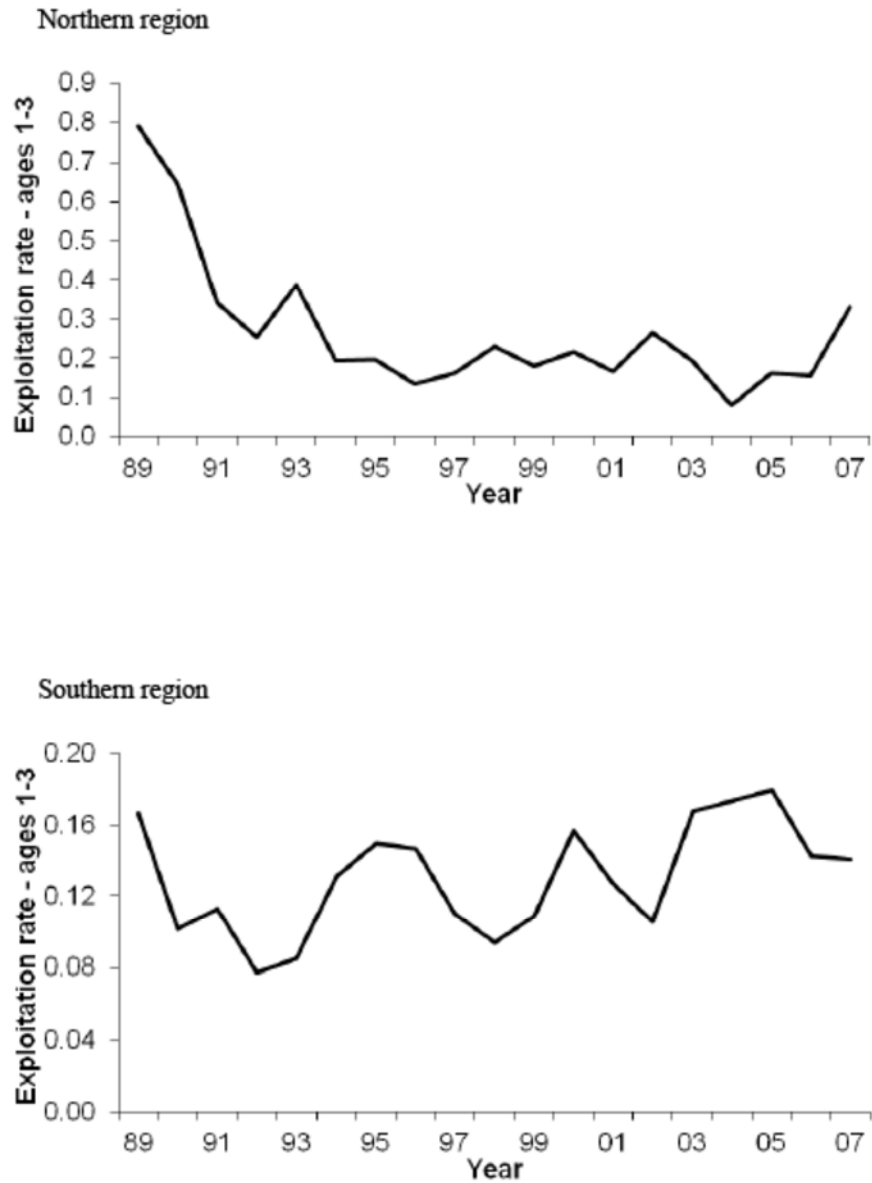
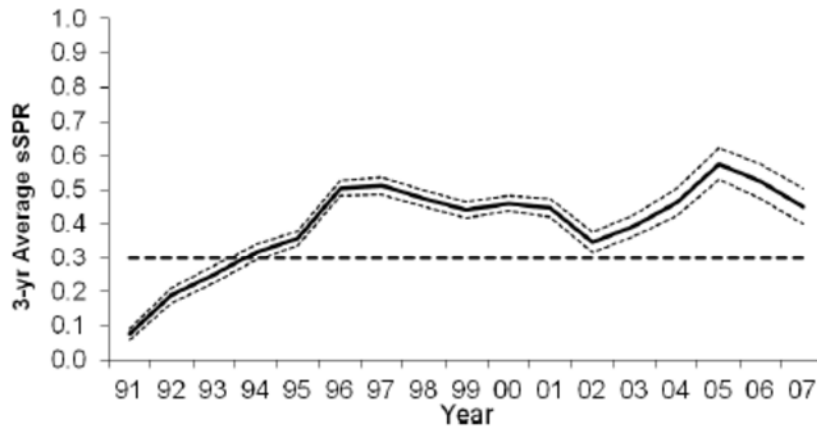


Figure 3. Estimated annual exploitation rate for red drum ages 1-3 in the northern and southern regions during 1989-2007 (Source: SAFMC 2009). Note: assessment results for the southern region are indicative of relative trends but not absolute values.

Northern region



Southern region

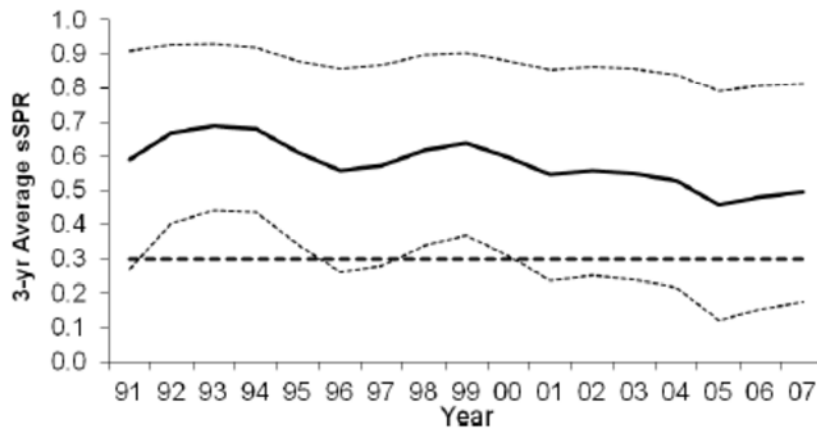


Figure 4. Northern and southern region estimates of three-year average static spawning potential ratio with ± 1.96 standard errors (dashed lines) during 1991-2007. Three-year averages include current and previous two years' sSPR estimates. The heavy dashed line shows the 30% overfishing threshold (Source: SAFMC 2009). Note: assessment results for the southern region are indicative of relative trends but not absolute values.

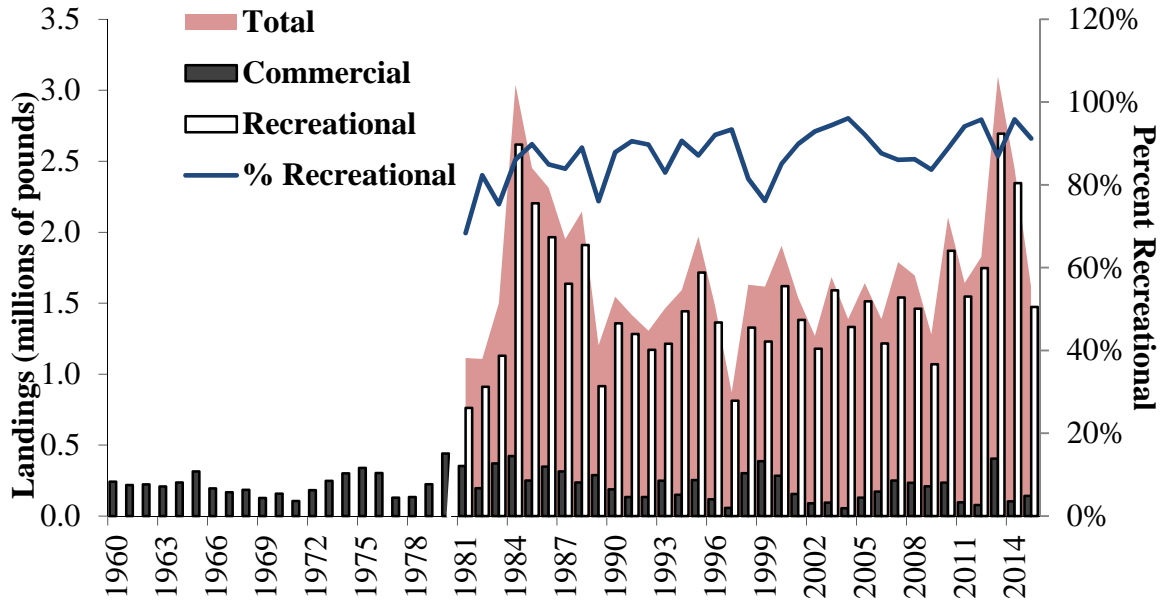


Figure 5. Commercial and recreational landings (pounds) of red drum. Recreational data not available prior to 1981. See Tables 2 and 3 for values and data sources.

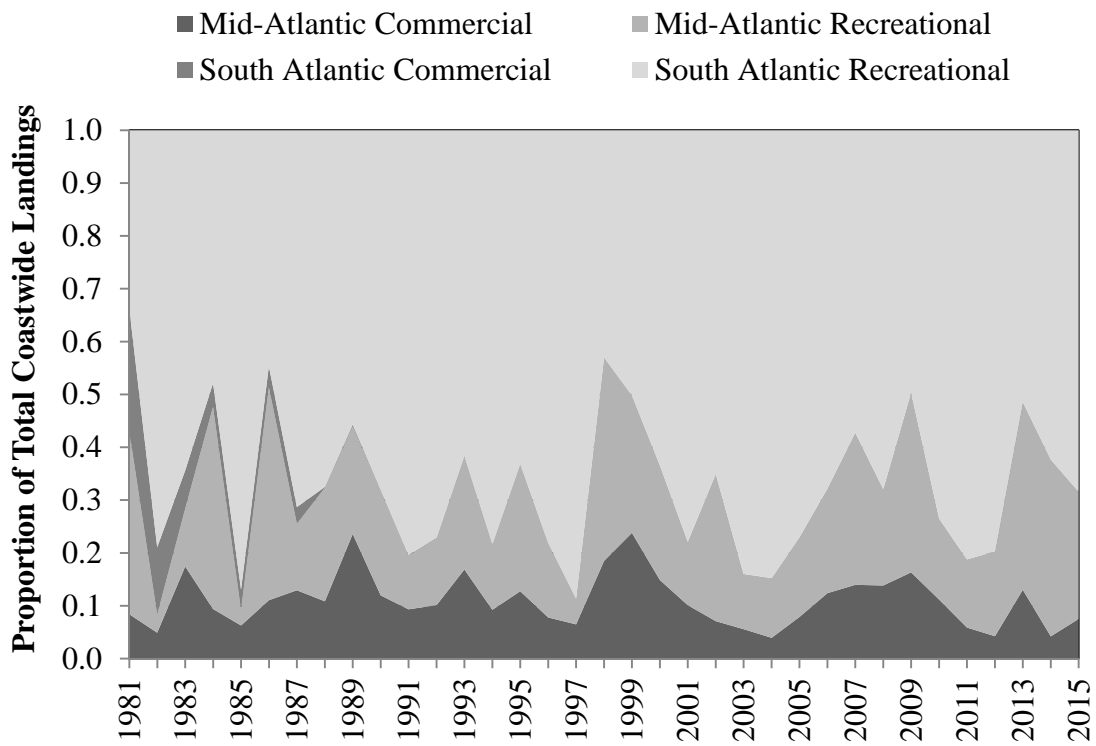


Figure 6. Proportion of regional, sector-specific landings to total coastwide landings (pounds). See Tables 2 and 3 for data sources.

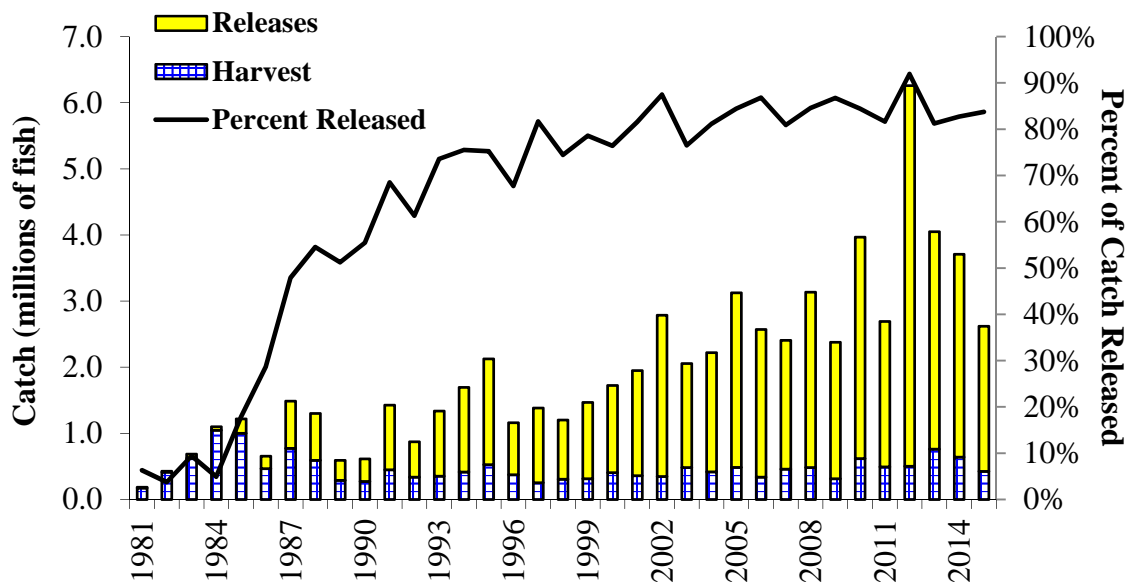


Figure 7. Recreational catch (harvest and alive releases) of red drum (numbers) and the proportion of catch that is released. See Tables 4 and 5 for values and data sources.

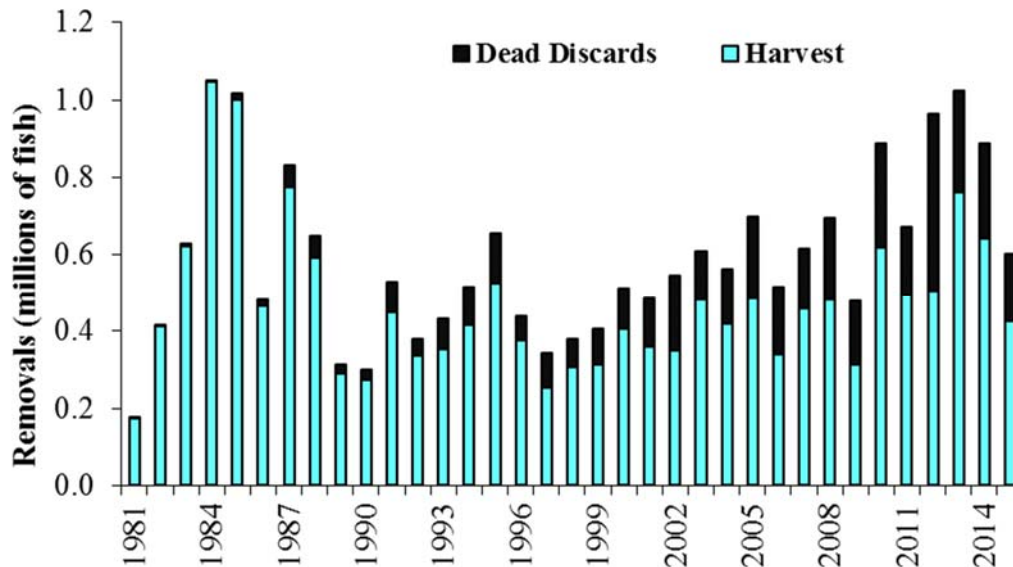


Figure 8. Recreational removals (harvest and dead discards) of red drum (numbers). Dead discards are estimated by applying an 8% discard mortality rate to alive releases. See Tables 4 & 5 for values and data sources.

XI. Tables

Table 1. Red drum regulations for 2015. The states of New Jersey through Florida are required to meet the requirements in the FMP; states north of New Jersey are encouraged to follow the regulations. All size limits are total length.

State	Recreational	Commercial
NJ	18" - 27", 1 fish	18" - 27", 1 fish
DE	20" - 27", 5 fish	20" - 27", 5 fish
MD	18" - 27", 1 fish	18" - 25", 5 fish
PRFC	18" - 25", 5 fish	18" - 25", 5 fish
VA	18" - 26", 3 fish	18" - 25", 5 fish
NC	18" - 27", 1 fish	18" - 27"; 250,000 lb harvest cap with overage payback (150,000 lbs Sept 1- April 30; 100,000 lbs May 1-Aug 31); harvest of red drum allowed with 7 fish daily trip limit; red drum must be less than 50% of catch (lbs); small mesh (<5" stretched mesh) gill nets attendance requirement May 1 - November 30. Fishing year: September 1 – August 31.
SC	15" - 23", 3 fish. Gigging allowed March-November	Gamefish Only
GA	14" - 23", 5 fish	Gamefish Only
FL	18" - 27", Northern Region- 2 fish; Southern Region- 1 fish	Sale of native fish prohibited

Table 2. Commercial landings (pounds) of red drum by state, 1981-2015. (Source: personal communication with NMFS Fisheries Statistics Division, Silver Spring, MD and ACCSP, Arlington, VA, except where noted below)

Year	NJ	DE	MD	PRFC	VA	NC	SC	GA	FL	Total
1981					200	93,420		261	258,374	352,255
1982					1,700	52,561	2,228	251	139,170	195,910
1983			100		41,700	219,871	2,274	1,126	105,164	370,235
1984					2,600	283,020	3,950	1,961	130,885	422,416
1985					1,100	152,676	3,512	3,541	88,929	249,758
1986			1,000		5,400	249,076	12,429	2,939	77,070	347,914
1987					2,600	249,657	14,689	4,565	42,993	314,504
1988			8,100	2	4,000	220,271		3,281	284	235,938
1989			1,000	86	8,200	274,356	165	3,963		287,770
1990			29	86	1,481	183,216		2,763		187,575
1991			7,533	3,808	24,771	96,045		1,637		133,794
1992			1,087	196	2,352	128,497		1,759		133,891
1993			55		8,637	238,099		2,533		249,324
1994			859		4,080	142,119		2,141		149,199
1995			6		2,992	248,122		2,578		253,698
1996			215		2,006	113,338		2,271		117,830
1997			22	4	3,820	52,502		1,395		57,743
1998	311		336		6,456	294,366		672		302,141
1999	241	6	504	186	10,856	372,942		1,115		385,850
2000			843	10	11,512	270,953		707		284,025
2001	*	*	727	191	4,905	149,616		*		155,439
2002	*	*	1,161	285	7,361	81,370		*		90,177
2003	*	*	631	47	2,716	90,525		*		93,919
2004	12	*	12	*	638	54,086		*		54,748
2005	*	*	37	51	527	128,770		*		129,385
2006	*	*	8	2	2,607	169,206		*		171,823
2007	*	*	90	58	6,372	243,658		*		249,747
2008	*	*	40	69	4,585	229,809		*		234,503
2009	129	*	*	157	8,315	200,296		*		208,909
2010	*	*	19	22	3,634	231,828		*		235,503
2011				3	4,369	91,980				96,352
2012	7,971		334	81	2,609	66,519				77,514
2013	176	0	2,730	268	28,766	371,949				403,889
2014	55	0	298	3	11,999	90,594		0	0	102,949
2015	*	0	*	*	664	140,889				141,836

* Notes: NJ landings from SAFIS, 2004-present; MD landings from state reporting program, 1991-present; PRFC landings from agency reporting program, 1988-present; VA landings from state reporting program, 1996-present; NC landings from state reporting program, 1994-present; GA landings from state reporting program, 2000-present, * indicates confidential landings because less than three dealers reported.

Table 3. Recreational landings (pounds) of red drum by state, 1981-2015. (Source: personal communication with NMFS Fisheries Statistics Division, Silver Spring, MD)

Year	NJ	DE	MD	VA	NC	SC	GA	FL	Total
1981			4,370	347,939	31,519	50,230	9,442	317,963	761,463
1982					37,511	340,686	52,150	480,676	911,023
1983			3,018	51,299	109,540	222,691	67,298	675,924	1,129,770
1984				1,285	1,160,539	183,282	294,583	976,971	2,616,660
1985					70,677	1,532,316	185,887	414,176	2,203,056
1986			754,161	145,517	31,594	498,586	173,837	360,725	1,964,420
1987				44,332	200,729	913,639	250,795	227,222	1,636,717
1988				9,030	451,974	1,050,049	385,860	12,507	1,909,420
1989			2,348	27,236	214,849	396,771	127,245	146,064	914,513
1990			2,679		302,994	631,819	161,712	258,569	1,357,773
1991			5,635	30,582	108,268	284,290	337,207	516,999	1,282,981
1992				55,324	109,134	411,484	198,751	396,555	1,171,248
1993				45,505	266,459	282,614	328,245	290,930	1,213,753
1994				3,684	192,060	314,632	353,616	578,412	1,442,404
1995				66,270	405,620	417,595	300,337	525,231	1,715,053
1996				1,512	204,556	396,394	164,756	596,483	1,363,701
1997				1,810	39,077	296,155	129,836	345,390	812,268
1998				34,861	591,428	129,619	84,348	487,091	1,327,347
1999				92,794	326,303	103,777	166,630	540,310	1,229,814
2000				95,596	316,029	93,043	228,965	885,447	1,619,080
2001				51,890	132,578	188,198	155,854	853,714	1,382,234
2002		860	15,154	155,212	182,225	103,831	170,572	551,128	1,178,982
2003				57,213	118,808	449,399	234,865	729,446	1,589,731
2004				32,415	124,264	312,569	296,777	566,508	1,332,533
2005				7,624	239,694	298,600	177,169	788,993	1,512,080
2006		2,064		21,039	251,735	160,760	143,699	636,742	1,216,039
2007				209,248	305,664	152,190	197,510	674,463	1,539,075
2008				72,510	236,744	254,305	244,594	652,613	1,460,766
2009				148,573	286,702	165,874	125,499	343,359	1,070,007
2010				40,323	281,587	451,144	319,427	776,346	1,868,827
2011					212,245	441,833	229,214	662,811	1,546,103
2012	0	396	26,788	27,422	238,310	368,445	107,368	978,727	1,747,456
2013	0	7,153	6,367	411,236	676,050	236,887	129,279	1,226,481	2,693,453
2014	0	0	0	221,280	598,166	242,371	154,332	1,129,663	2,345,812
2015	0	0	0	29,339	154,496	269,787	97,690	922,065	1,473,377

Table 4. Recreational landings (numbers) of red drum by state, 1981-2015. (Source: personal communication with NMFS Fisheries Statistics Division, Silver Spring, MD)

Year	NJ	DE	MD	VA	NC	SC	GA	FL	Total
1981			601	49,630	15,054	27,319	6,323	75,244	174,171
1982					16,445	160,760	30,757	204,401	412,363
1983			2,413	32,940	81,528	104,806	56,854	344,513	623,054
1984				1,457	108,787	129,547	258,188	549,381	1,047,360
1985				0	22,077	530,110	183,837	265,185	1,001,209
1986			12,804	28,139	17,501	193,188	102,279	113,440	467,351
1987				2,186	61,100	522,420	138,062	51,225	774,993
1988				4,311	142,626	287,916	147,042	9,542	591,437
1989			1,014	12,007	62,359	127,492	51,557	34,748	289,177
1990			1,279	0	33,149	118,666	76,304	44,280	273,678
1991			2,745	17,119	38,658	125,833	162,802	102,727	449,884
1992				13,275	23,593	112,534	83,861	104,265	337,528
1993				14,005	49,493	119,189	105,710	65,140	353,537
1994				1,378	28,953	129,515	134,214	120,938	414,998
1995				3,665	88,593	202,430	134,915	96,927	526,530
1996				572	36,746	130,649	60,251	146,823	375,041
1997				1,920	8,749	129,022	39,041	75,235	253,967
1998				13,070	114,638	46,509	24,929	107,982	307,128
1999				12,425	64,739	44,069	67,283	126,180	314,696
2000				22,603	61,618	37,217	94,144	191,070	406,652
2001				6,967	23,142	61,420	90,376	177,633	359,538
2002		275	5,521	49,795	42,541	41,190	90,993	119,010	349,325
2003				13,607	25,481	162,484	122,259	159,331	483,162
2004				5,005	30,017	107,803	138,893	136,728	418,446
2005				2,766	51,807	130,655	105,655	195,550	486,433
2006		468	6,362	12,665	55,714	48,703	68,813	145,860	338,585
2007				46,405	66,789	72,261	113,237	161,427	460,119
2008				20,847	50,809	119,471	133,107	159,246	483,480
2009				38,670	57,543	70,326	68,857	79,635	315,031
2010				11,076	64,024	172,708	194,826	175,828	618,462
2011	995				45,143	161,503	106,962	180,001	494,604
2012		296	17,869	28,149	52,948	121,068	45,766	238,191	504,287
2013		1,686	2,134	124,156	164,217	97,387	73,826	297,527	760,933
2014	0	0	0	53,545	116,921	103,892	91,764	275,536	641,658
2015	0	0	2	7,792	36,704	106,620	48,172	227,014	426,304

Table 5. Recreational alive releases and dead discards (numbers) of red drum by state, 1981-2015. Dead discards are estimated based on an 8% release mortality rate. (Source: personal communication with NMFS Fisheries Statistics Division, Silver Spring, MD.)

Year	NJ	DE	MD	VA	NC	SC	GA	FL	Total	Dead Discards
1981					2,230	417		9,042	11,689	935
1982						2,496	3,377	10,172	16,045	1,284
1983					1,866	6,751	1,417	54,723	64,757	5,181
1984					2,931	0	4,232	47,196	54,359	4,349
1985				1,115		16,688	6,315	193,399	217,517	17,401
1986				7,595		24,018	56,045	100,095	187,753	15,020
1987					18,499	82,595	234,676	377,959	713,729	57,098
1988				3,958	24,874	269,176	177,319	233,988	709,315	56,745
1989			2,918	7,038	7,566	42,824	71,162	172,303	303,811	24,305
1990			0	934	12,452	102,611	156,263	68,667	340,927	27,274
1991			4,432	14,461	121,178	99,968	92,803	645,773	978,615	78,289
1992	301			15,383	60,230	46,269	128,066	284,893	535,142	42,811
1993				50,434	182,301	146,324	140,386	465,656	985,101	78,808
1994				10,684	107,662	324,706	146,039	691,261	1,280,352	102,428
1995				33,560	164,520	362,844	356,618	683,706	1,601,248	128,100
1996				2,424	35,752	176,517	71,983	500,374	787,050	62,964
1997		2,571		109,754	259,570	175,772	22,736	560,559	1,130,962	90,477
1998			2,768	93,660	199,701	84,274	33,882	481,009	895,294	71,624
1999			2,148	232,893	247,146	87,776	18,586	565,981	1,154,530	92,362
2000			1,458	196,541	203,967	94,050	129,190	693,152	1,318,358	105,469
2001				30,365	238,552	221,045	249,892	850,044	1,589,898	127,192
2002		1,388	18,412	801,239	640,857	142,931	168,902	663,879	2,437,608	195,009
2003		731	2,935	43,379	75,561	430,052	272,897	748,765	1,574,320	125,946
2004				33,777	181,252	438,173	141,972	1,006,814	1,801,988	144,159
2005				28,351	378,541	493,595	334,521	1,405,967	2,640,975	211,278
2006		875	12,357	185,859	510,264	539,936	136,306	847,269	2,232,866	178,629
2007				110,566	416,352	436,797	225,985	758,684	1,948,384	155,871
2008		75	217	236,787	658,887	552,217	313,743	889,550	2,651,476	212,118
2009			14,754	178,396	429,776	751,123	167,704	521,659	2,063,412	165,073
2010			2,182	28,580	635,876	786,452	483,650	1,414,115	3,350,855	268,068
2011				61,330	207,697	664,291	213,781	1,051,143	2,198,242	175,859
2012	0	5,873	280,000	2,503,237	1,533,006	543,618	90,237	799,428	5,755,399	460,432
2013	0	407	2,207	220,305	654,030	673,377	198,722	1,541,541	3,290,589	263,247
2014	0	41	273	114,305	383,421	635,152	285,770	1,648,723	3,067,685	245,415
2015	0	0	774	25,835	334,510	571,433	168,338	1,094,215	2,195,105	175,608